7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Conducted power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

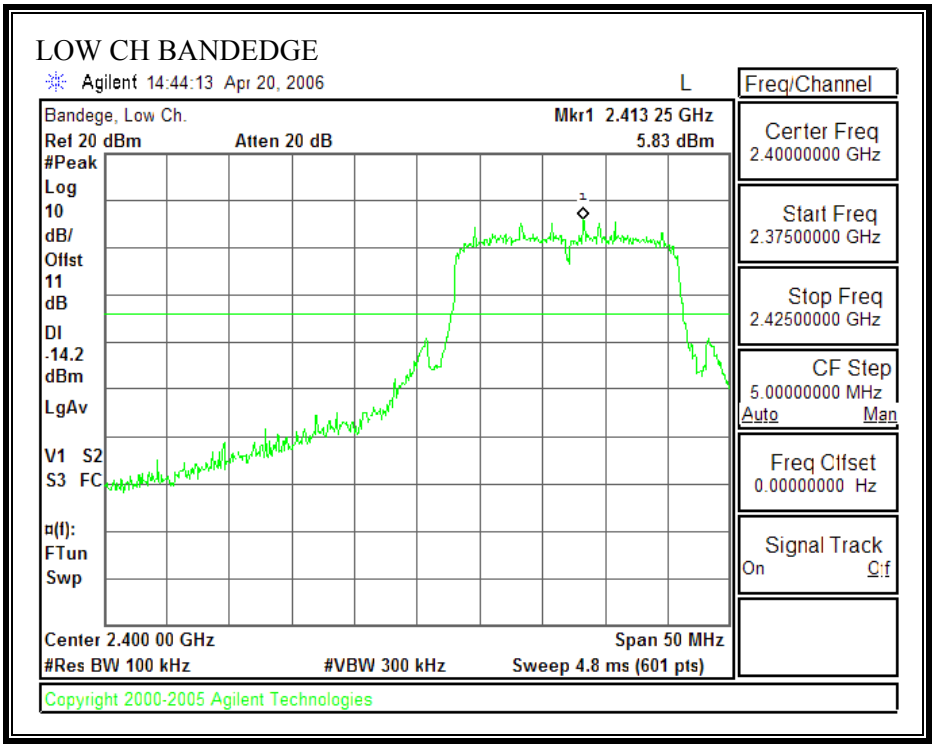
No non-compliance noted:

802.11g Mode Legacy CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0.

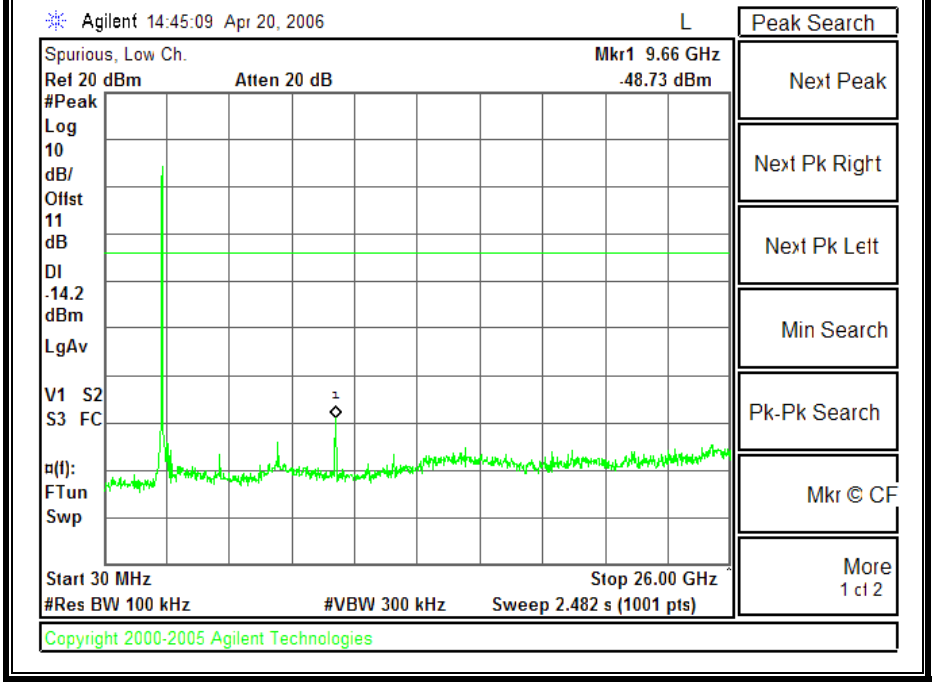
802.11n Mode 20 MHz CDD MCS 0:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

LOW CH BANDEDGE, 2412 MHz

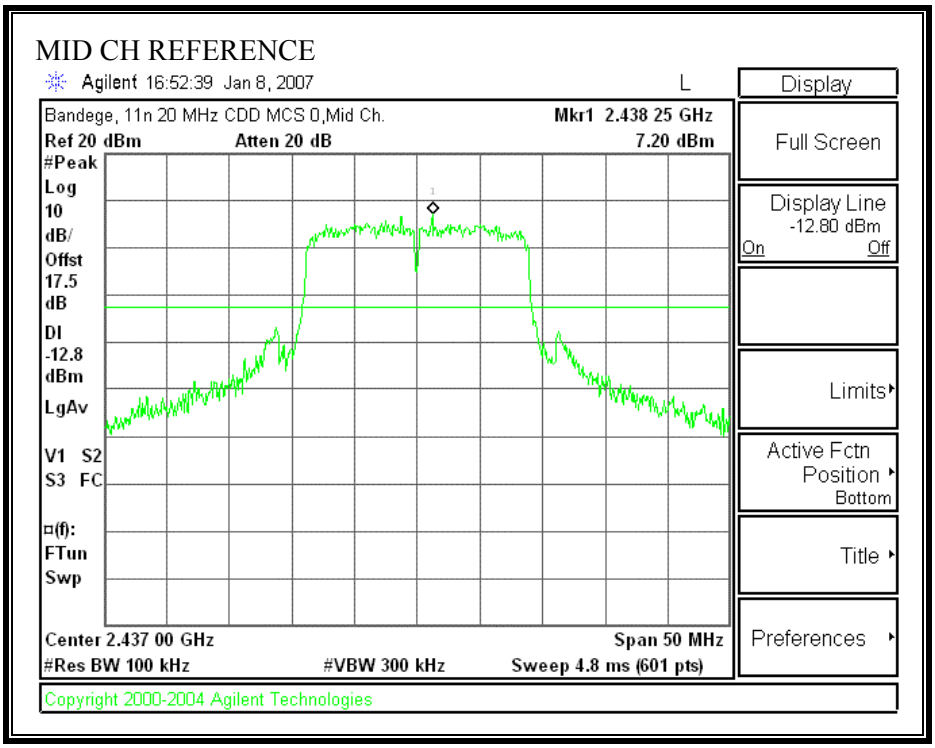


LOW CH SPURIOUS

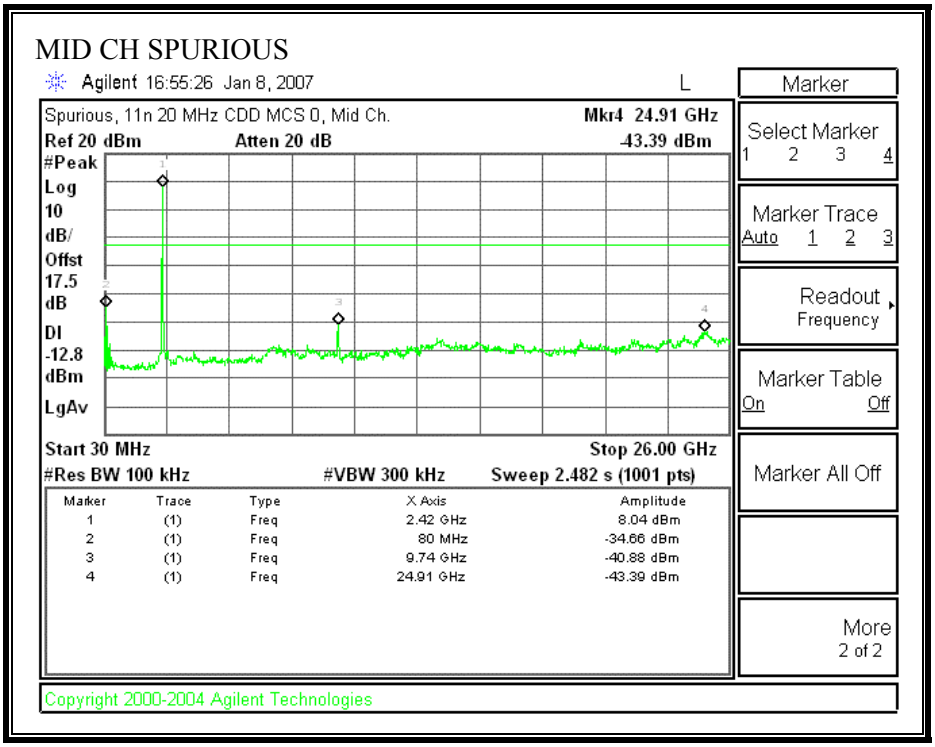


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

MID CH BANDEGE, 2437 MHz

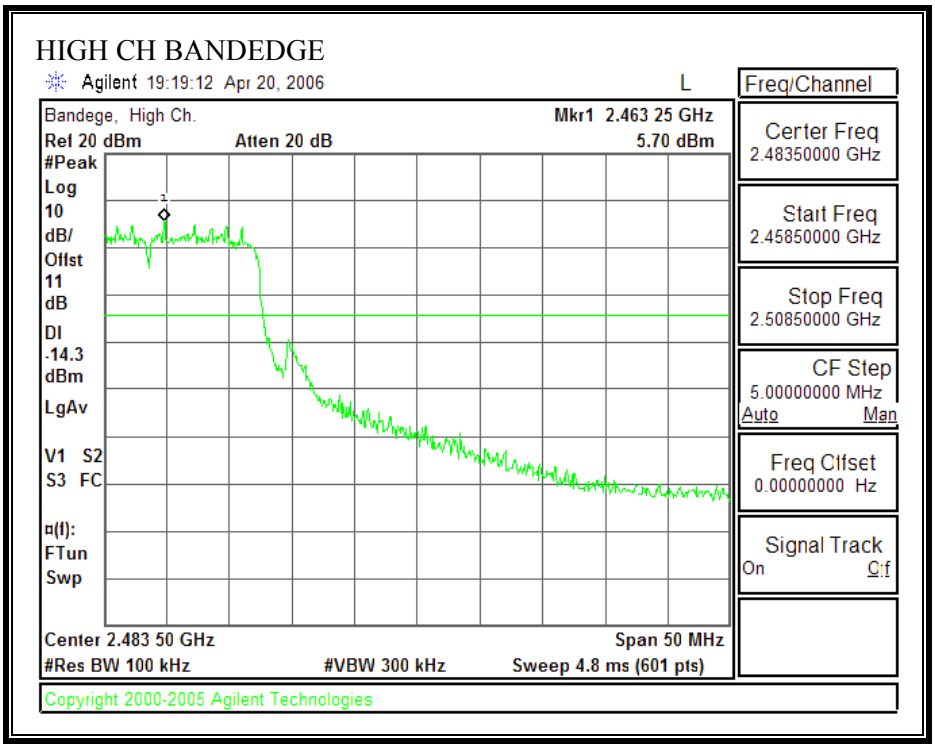


MID CH SPURIOUS

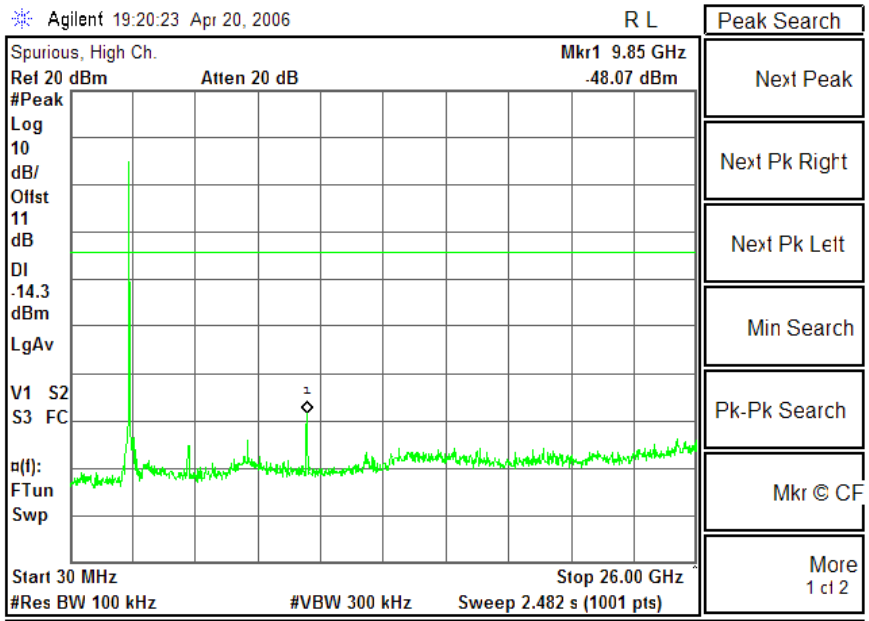


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0

HI CH BANDEDGE, 2462 MHz

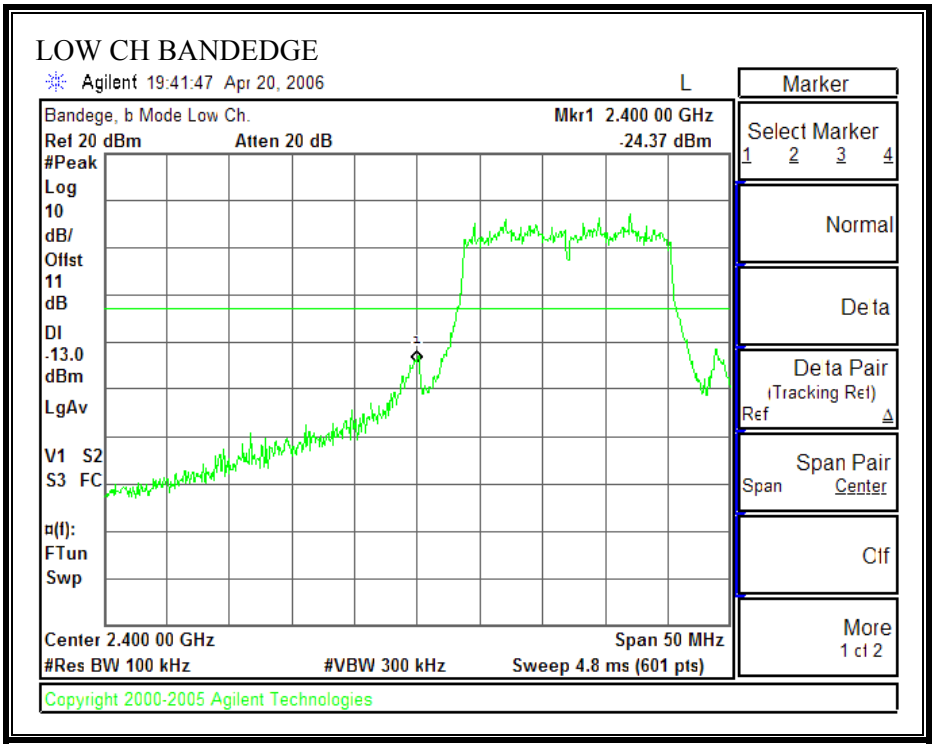


HIGH CH SPURIOUS

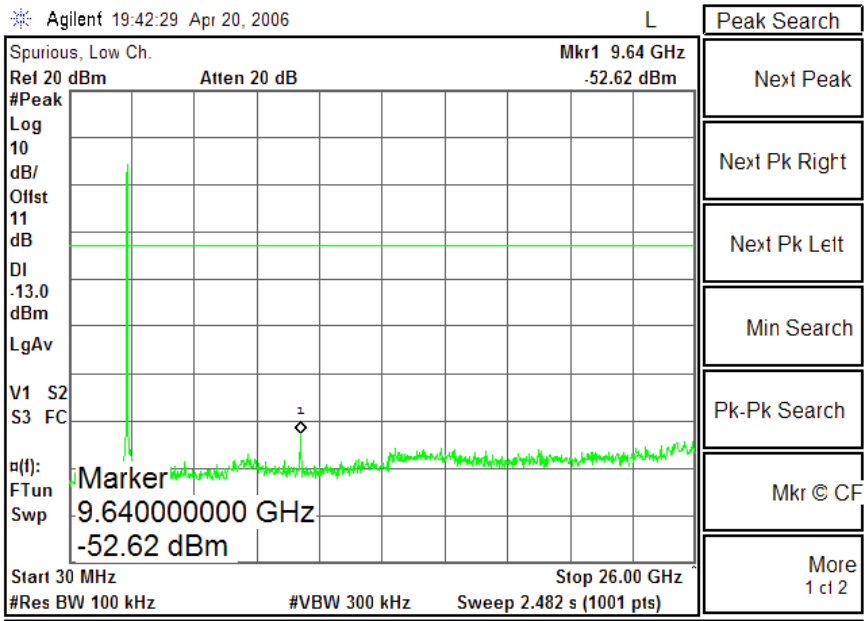


SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

LOW CH BANDEDGE, 2412 MHz

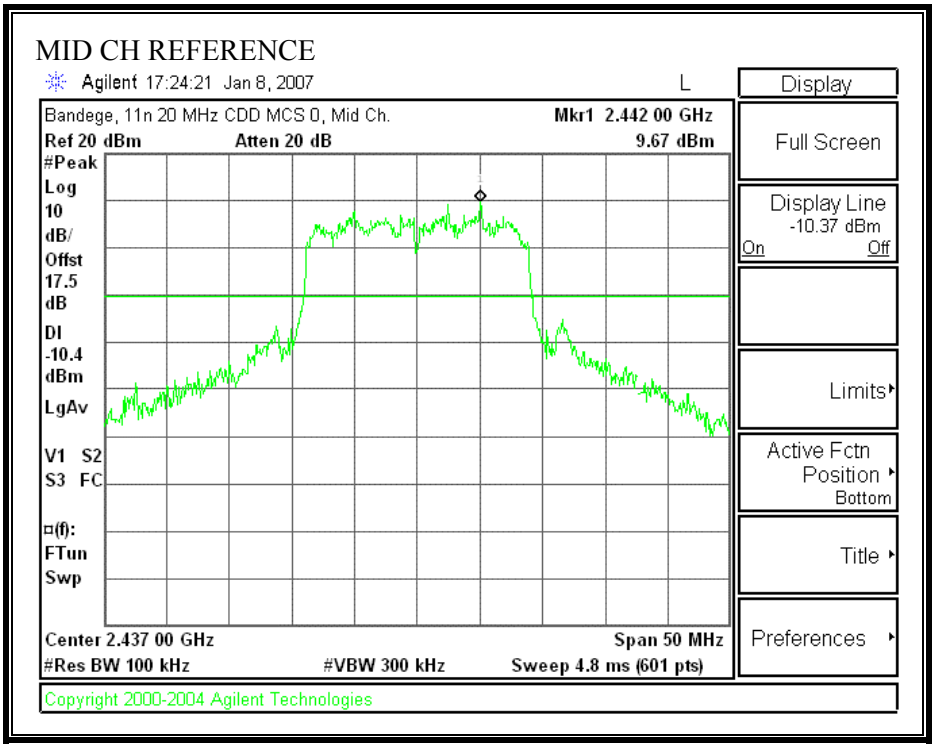


LOW CH SPURIOUS

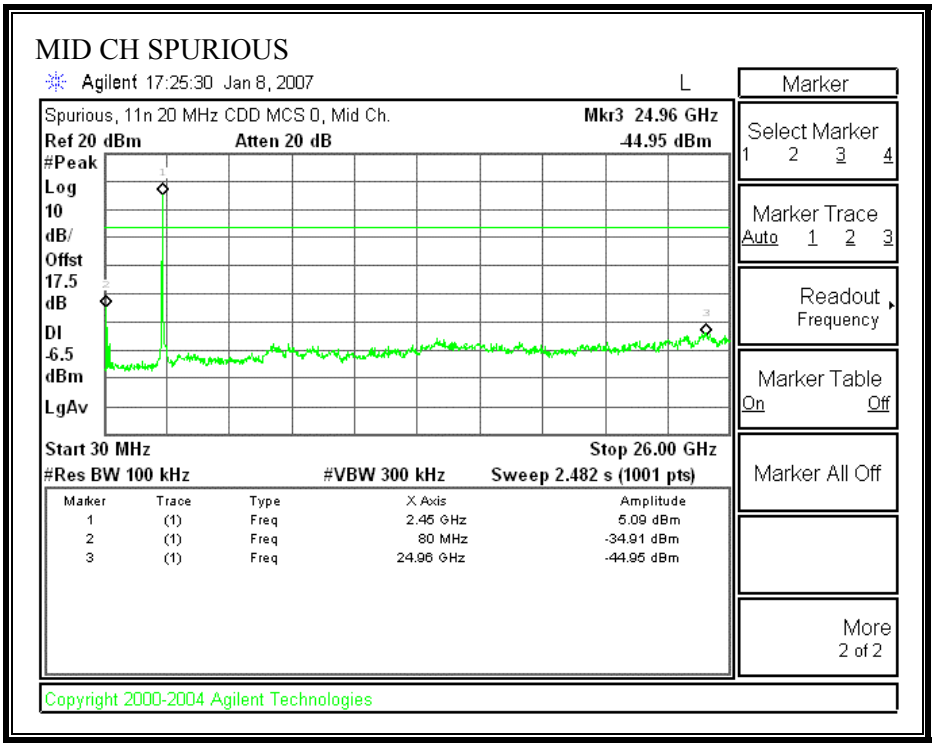


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

MID CH BANDEGE, 2437 MHz

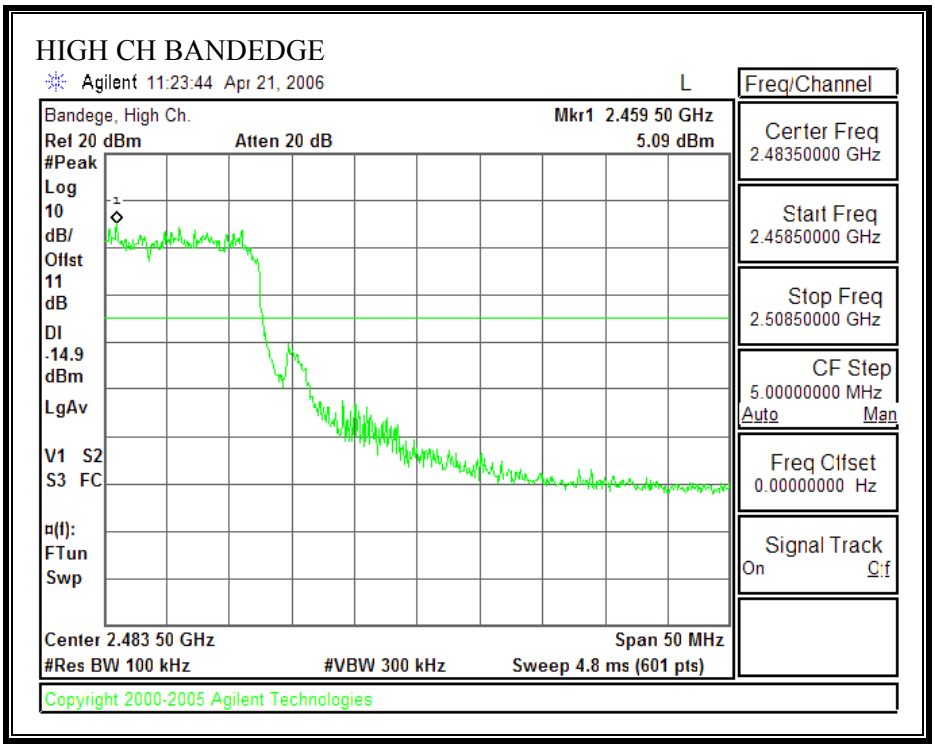


MID CH SPURIOUS

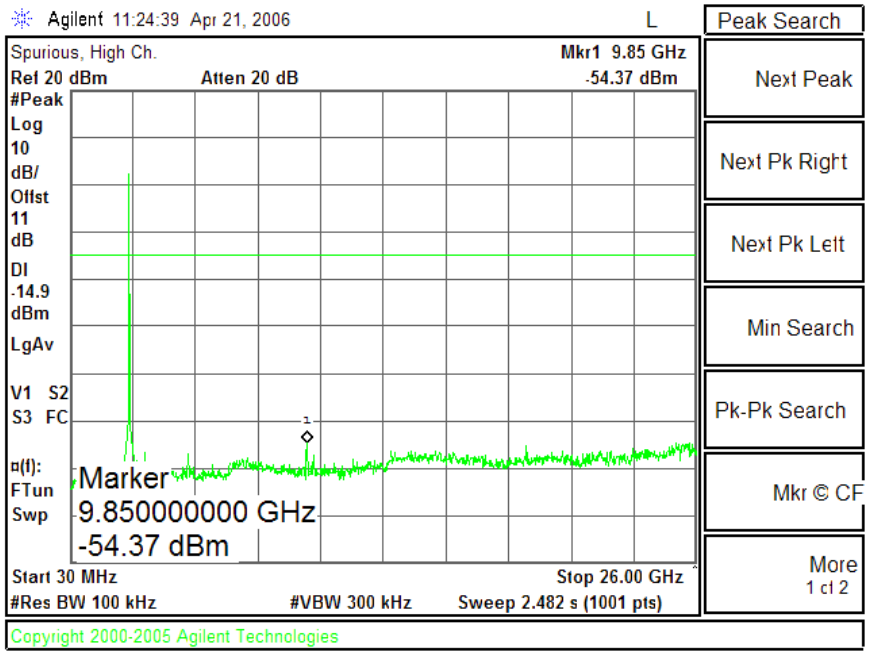


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

HIGH CH BANDEDGE, 2462 MHz



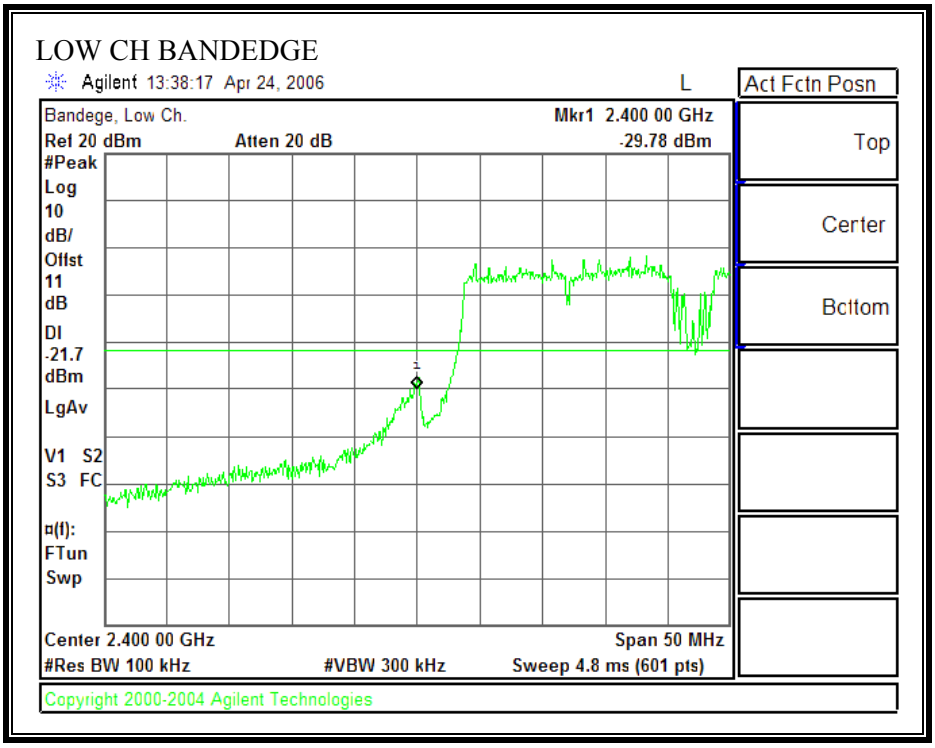
HIGH CH SPURIOUS



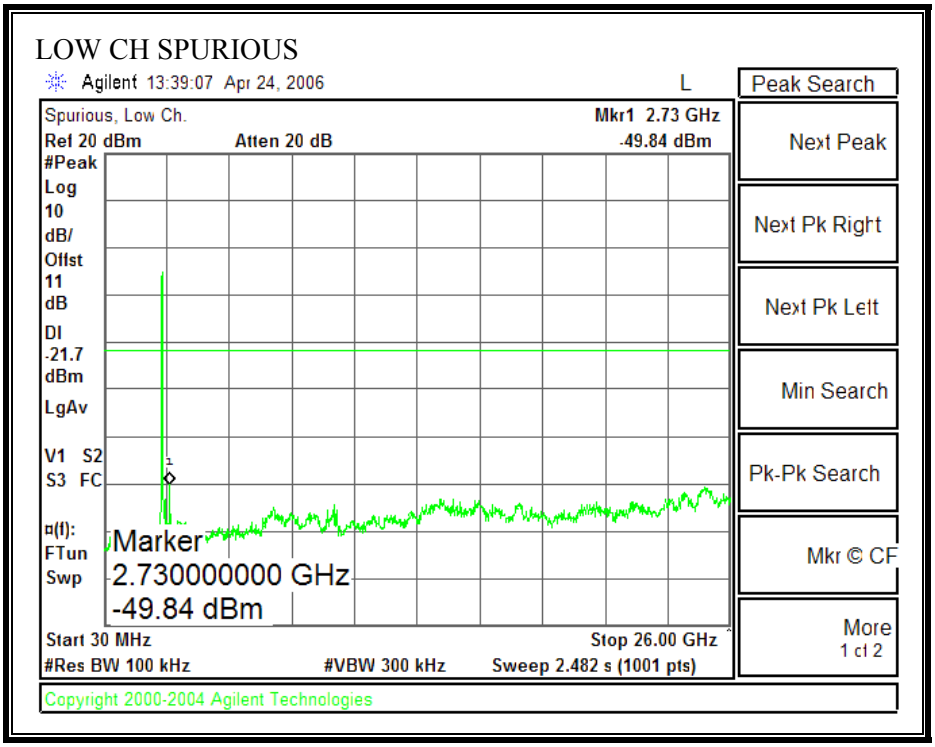
802.11n Mode 40 MHz CDD MCS 32

SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)

LOW CH BANDEDGE, 2422 MHz

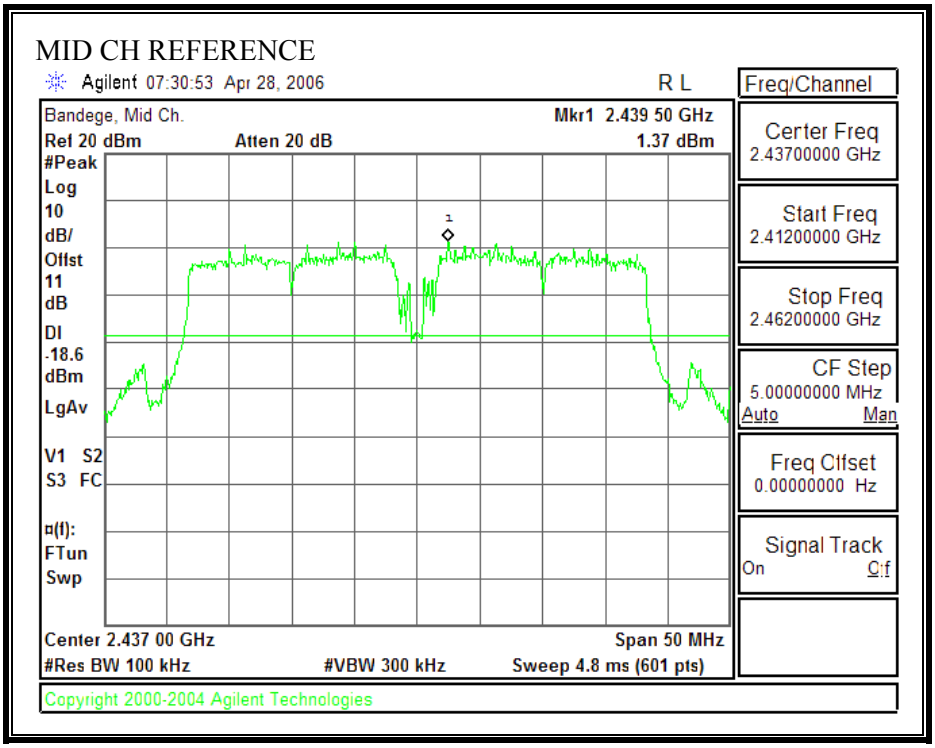


LOW CH SPURIOUS

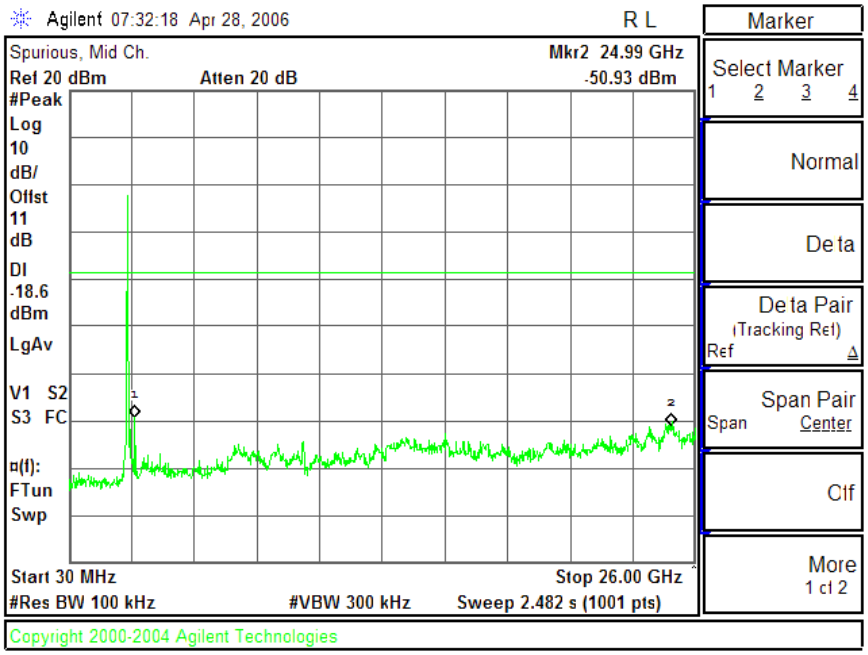


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

MID CH BANDEGE, 2437 MHz

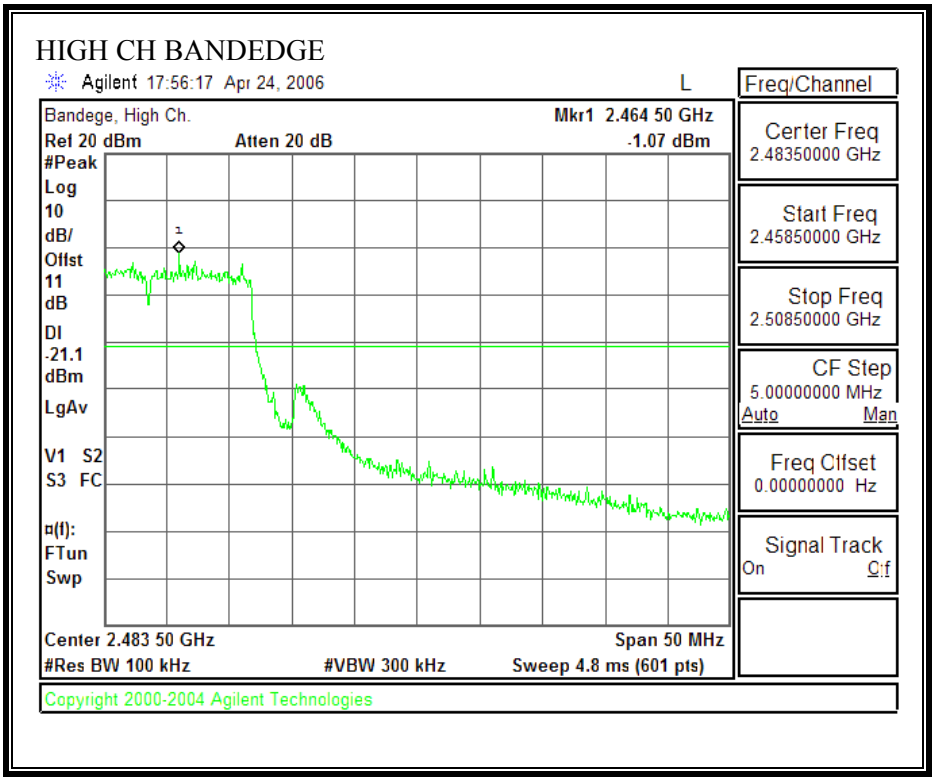


MID CH SPURIOUS

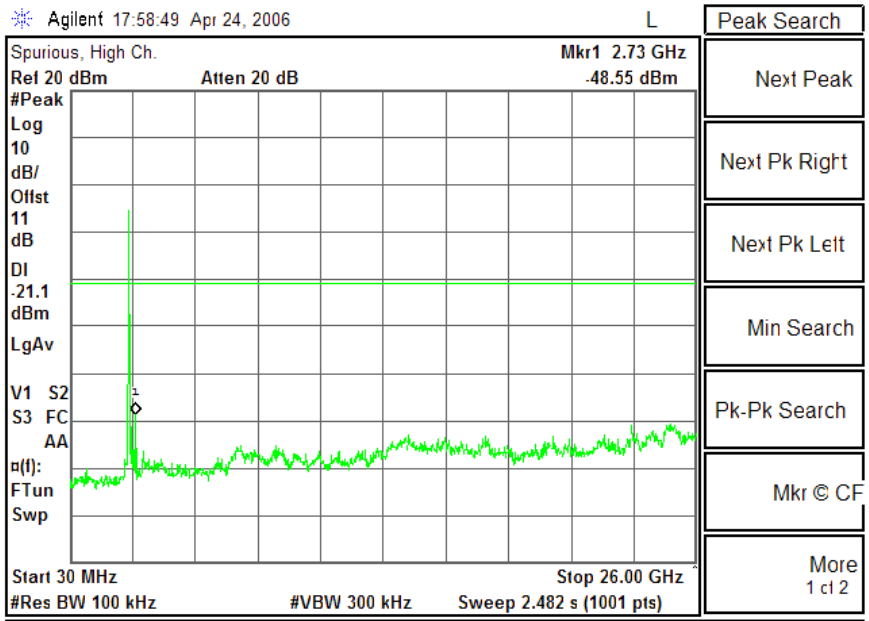


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)

HIGH CH BANDEDGE, 2452 MHz

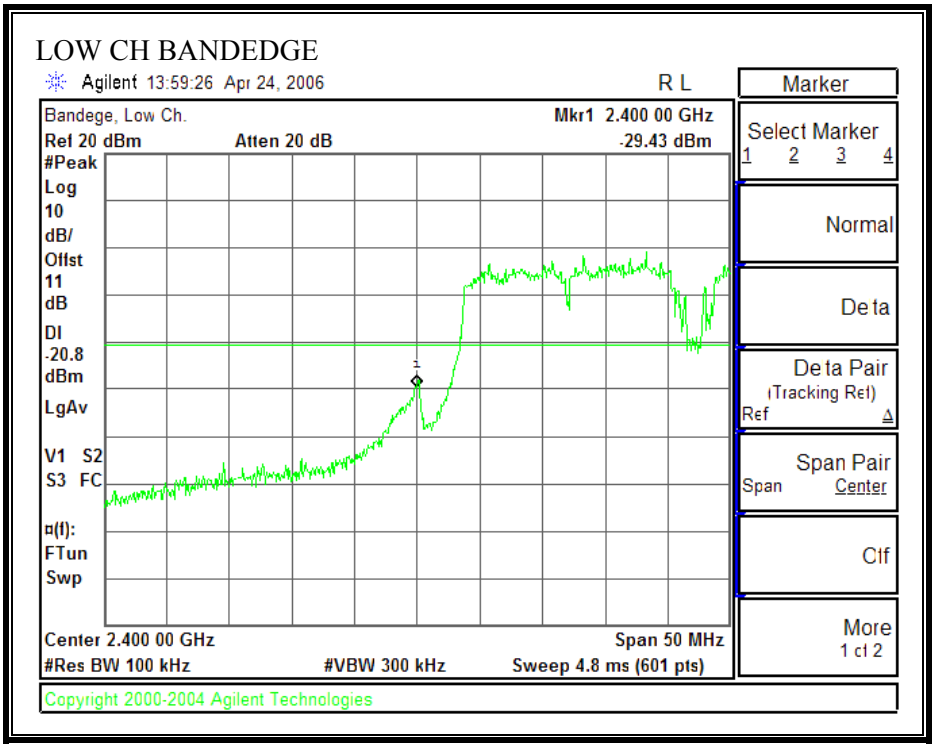


HIGH CH SPURIOUS

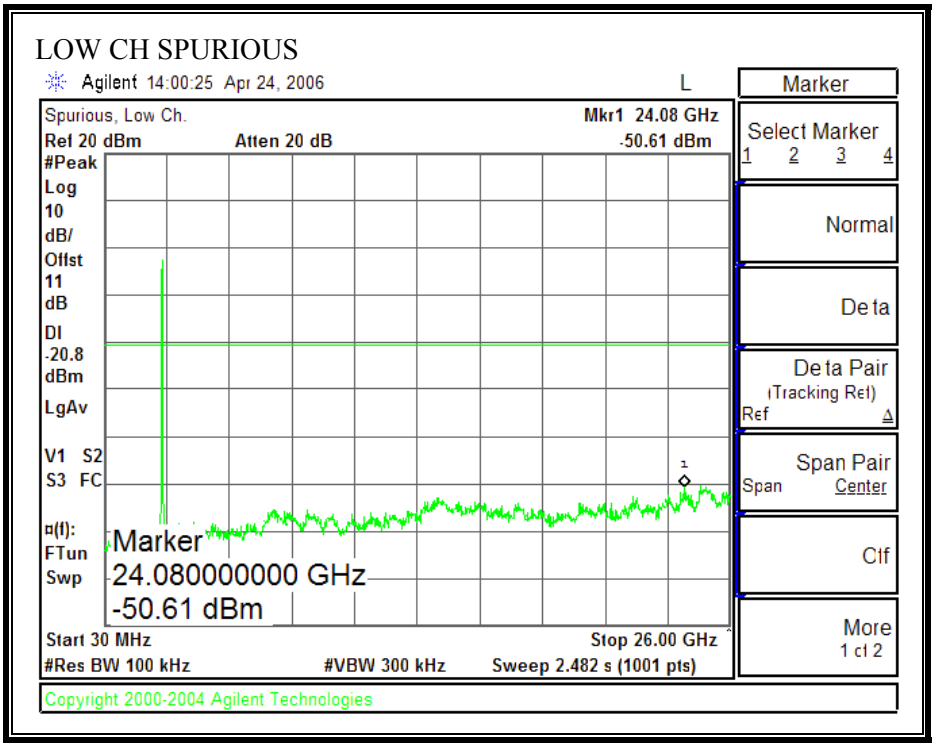


SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

LOW CH BANDEDGE, 2422 MHz

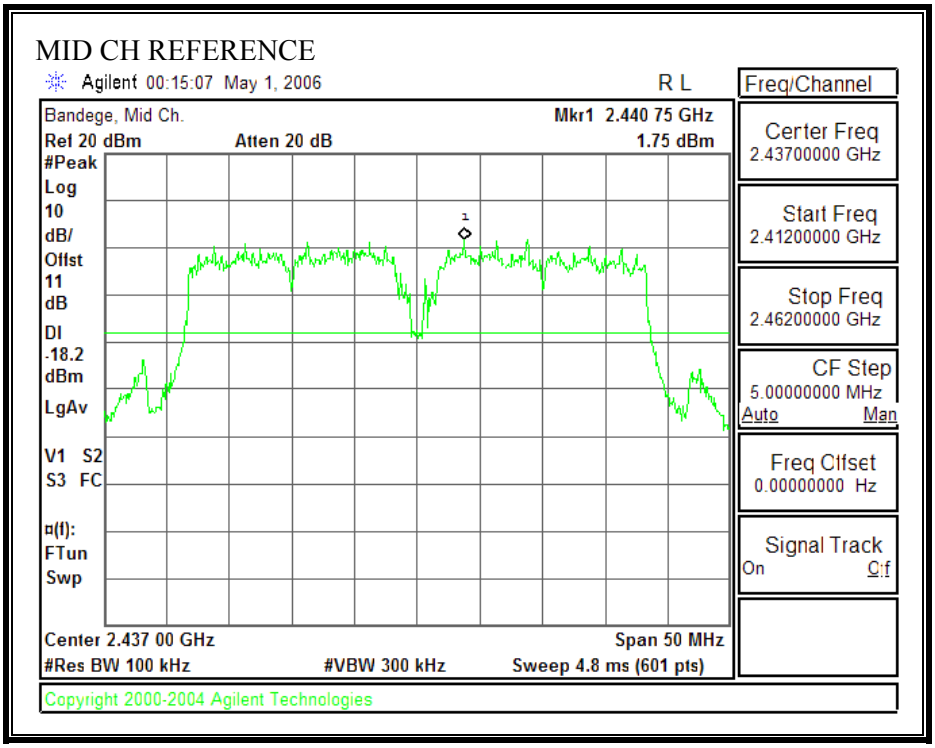


LOW CH SPURIOUS

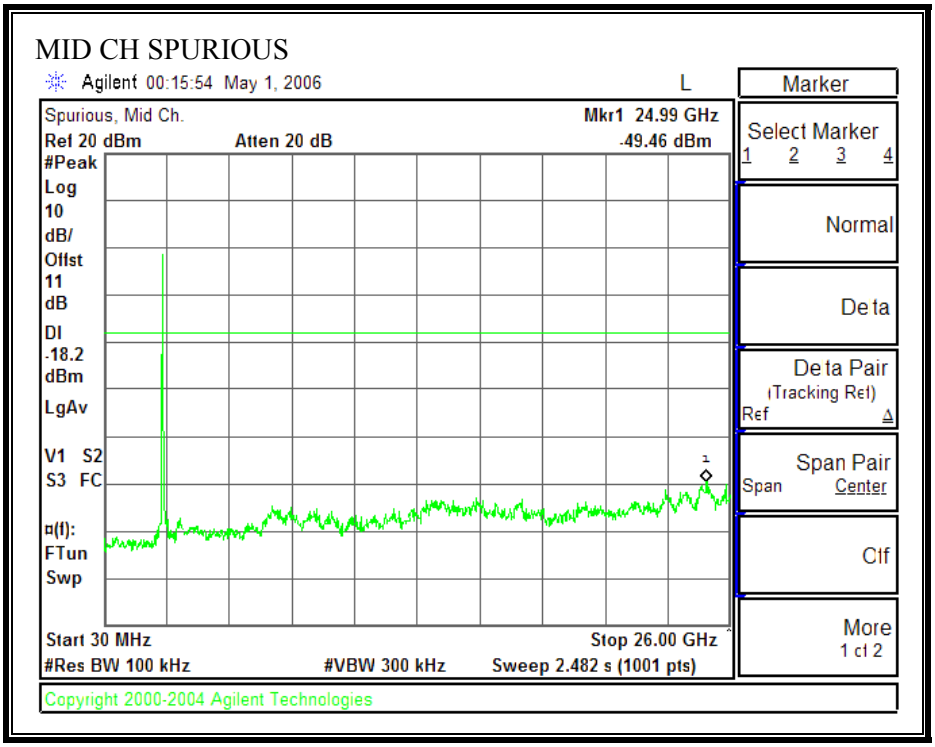


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

MID CH BANDEGE, 2437 MHz

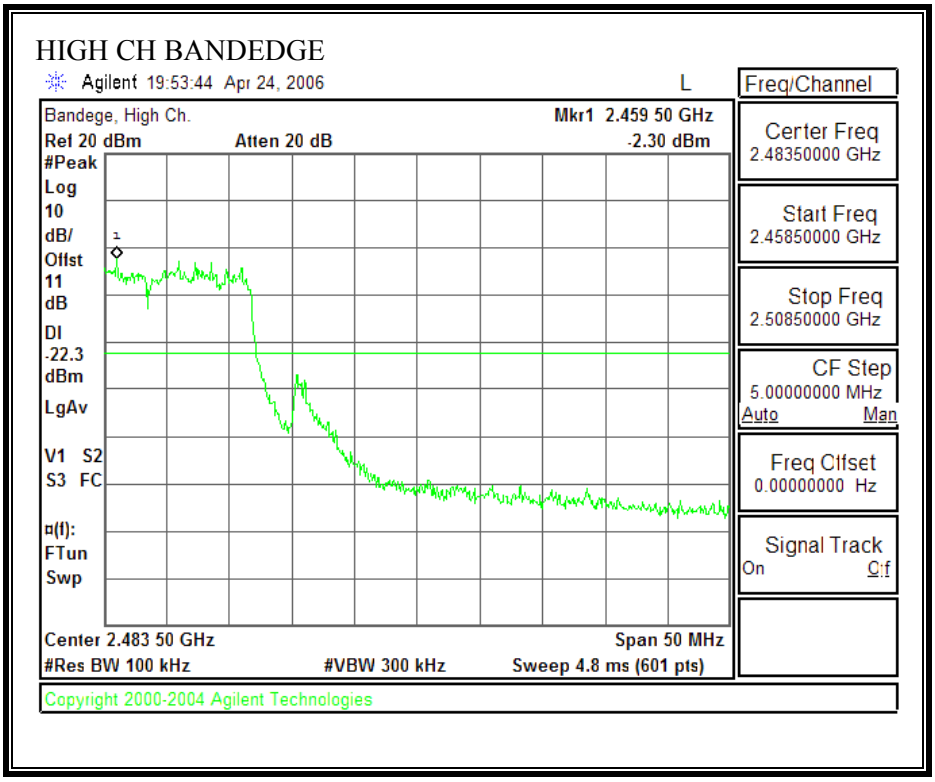


MID CH SPURIOUS

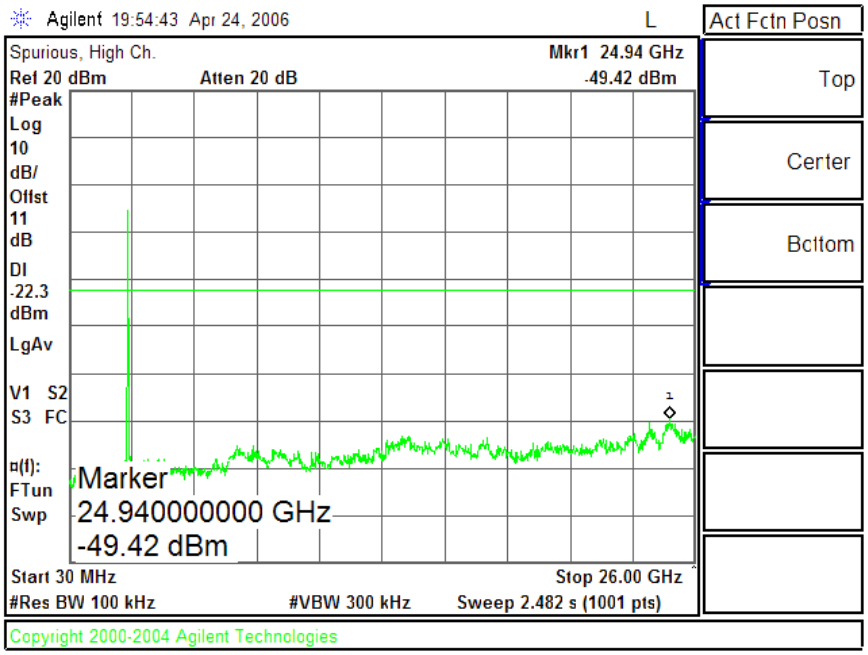


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

HIGH CH BANDEDGE, 2452 MHz



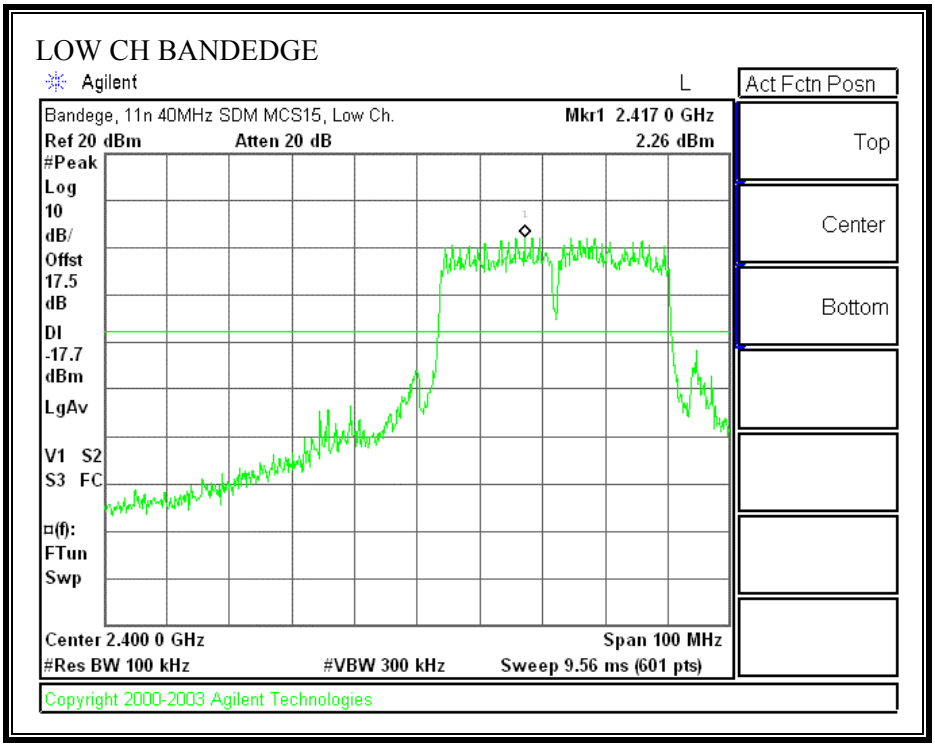
HIGH CH SPURIOUS



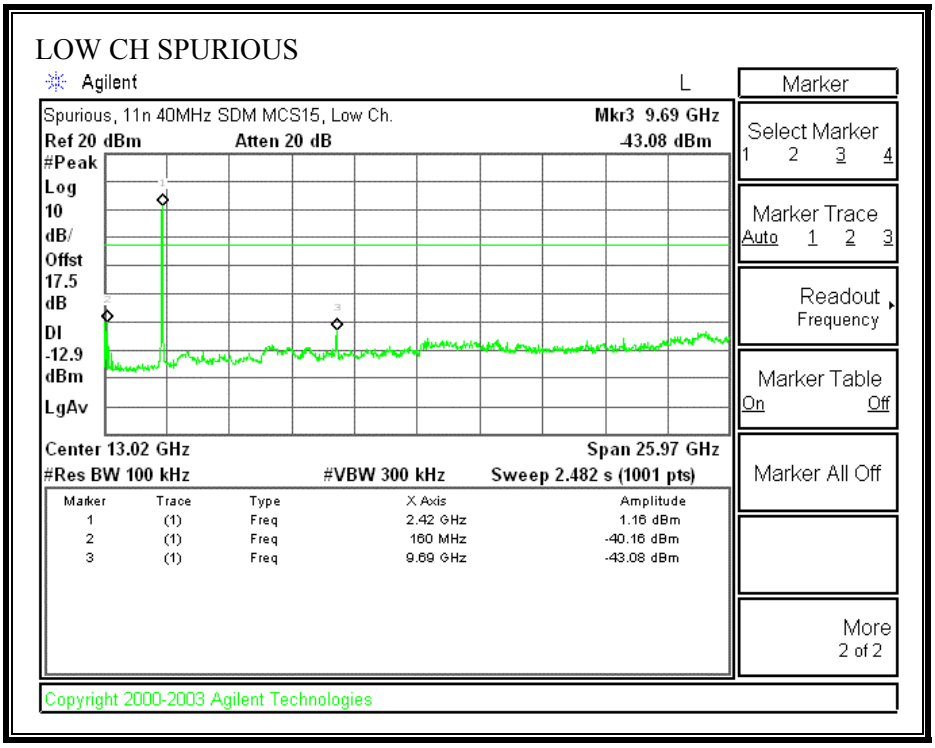
802.11n Mode 40 MHz SDM MCS 15:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)

LOW CH BANDEDGE, 2422 MHz

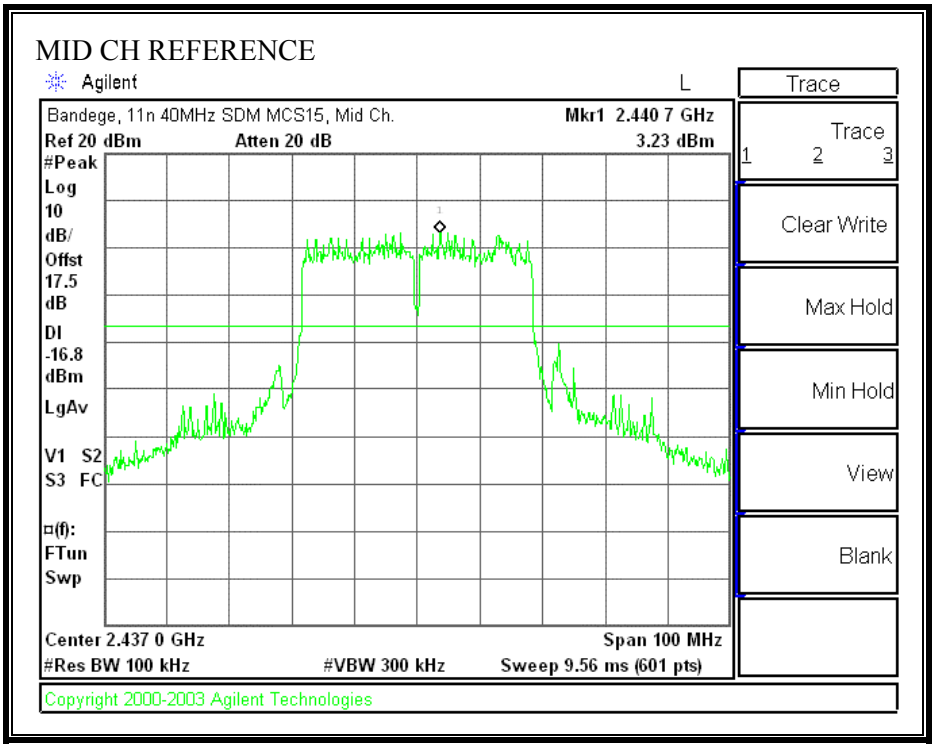


LOW CH SPURIOUS

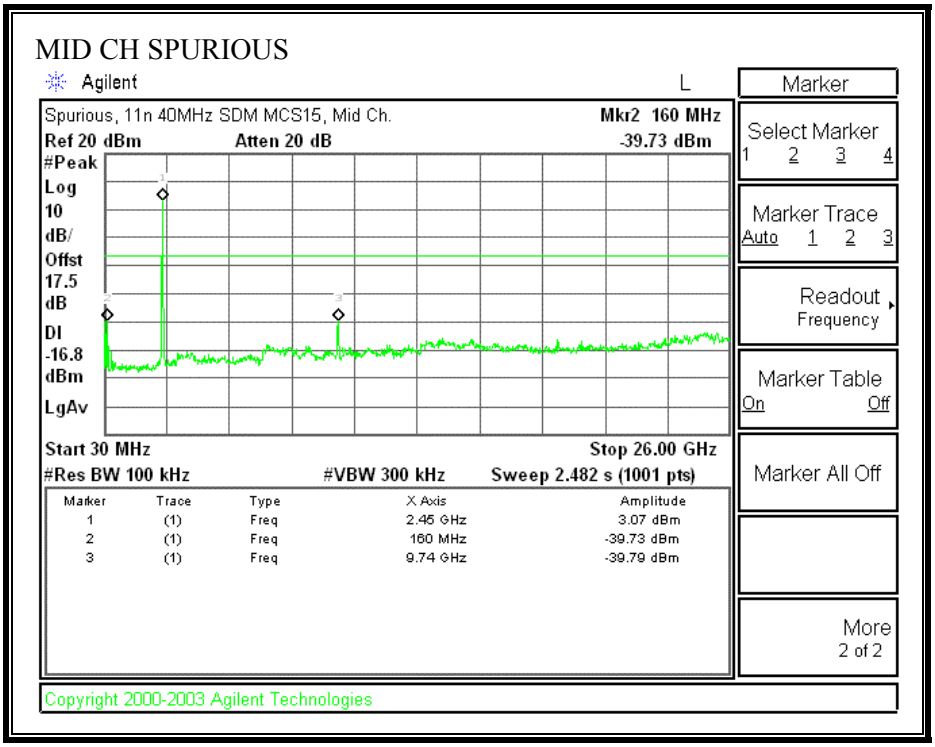


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

MID CH BANDEGE, 2437 MHz

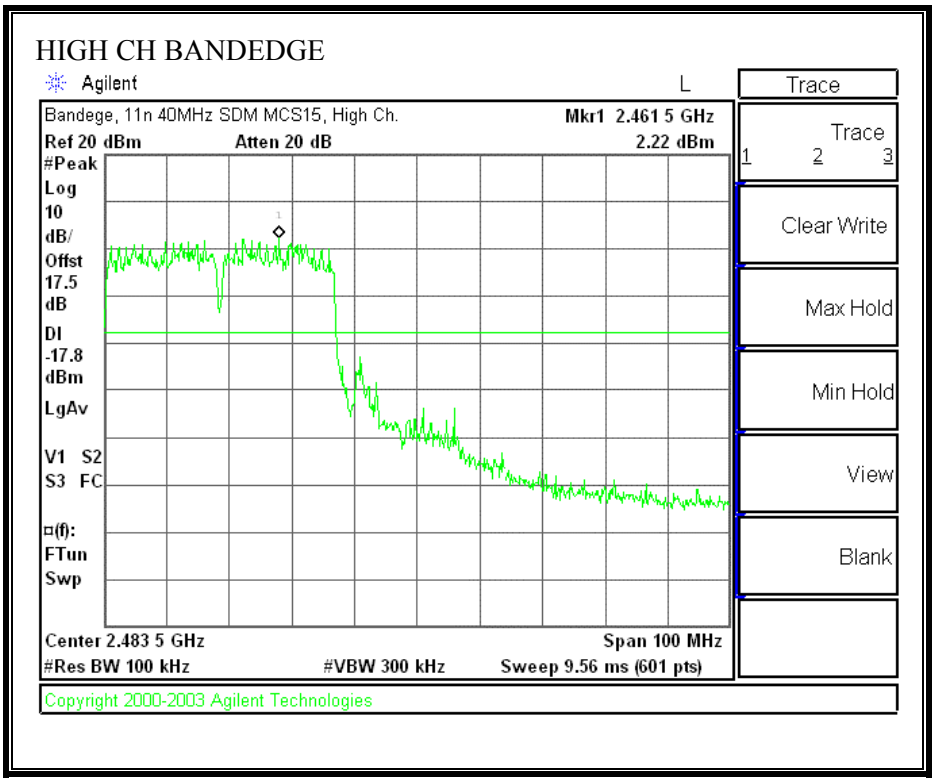


MID CH SPURIOUS

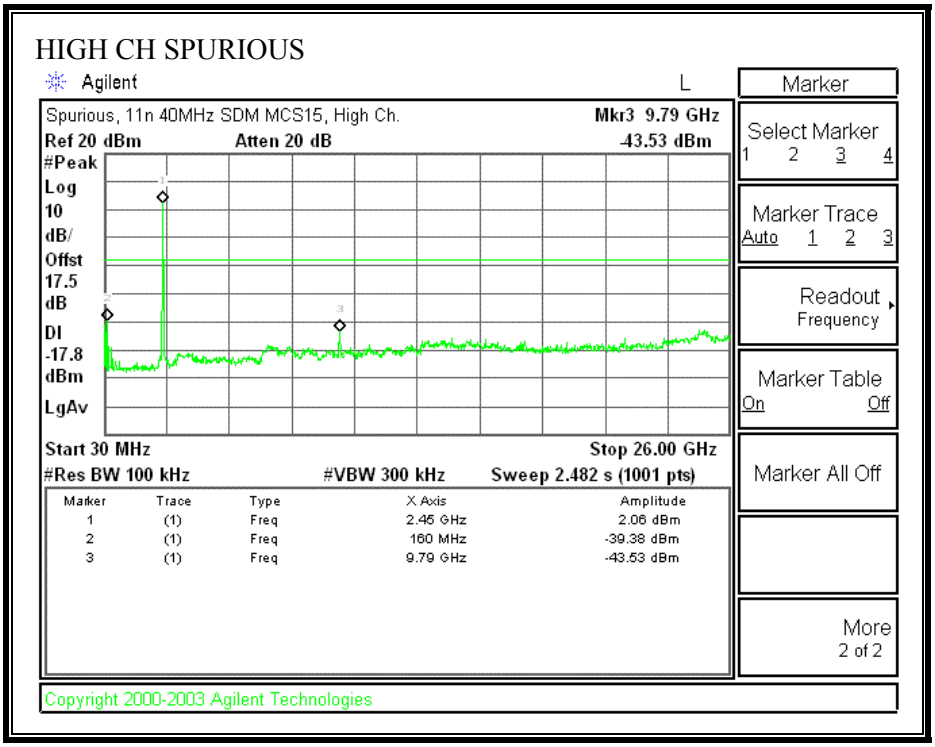


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)

HIGH CH BANDEDGE, 2452 MHz

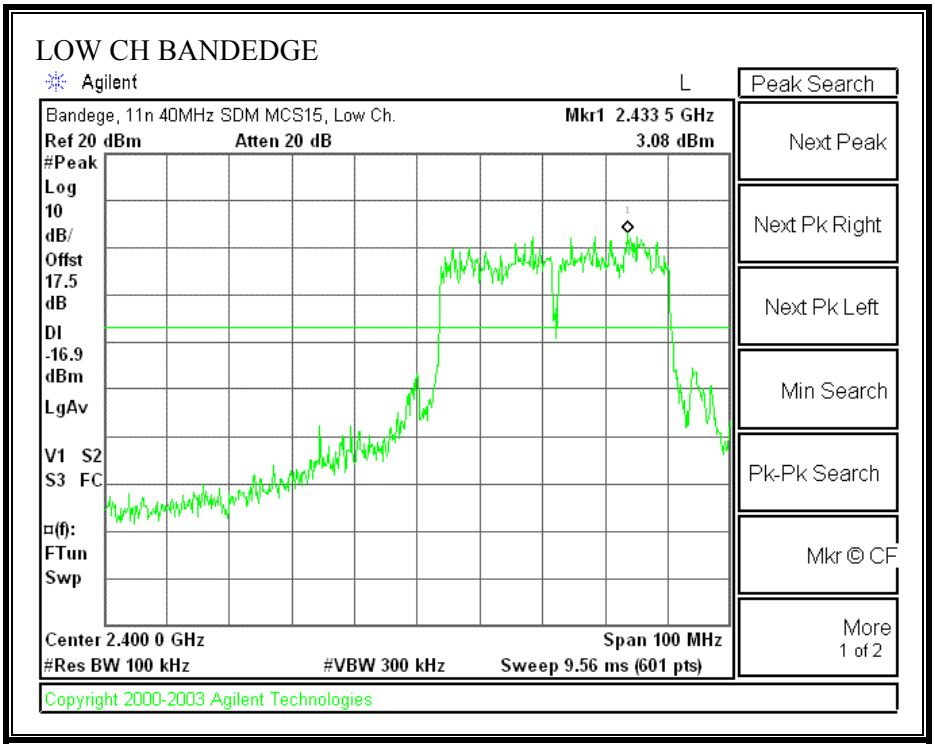


HIGH CH SPURIOUS

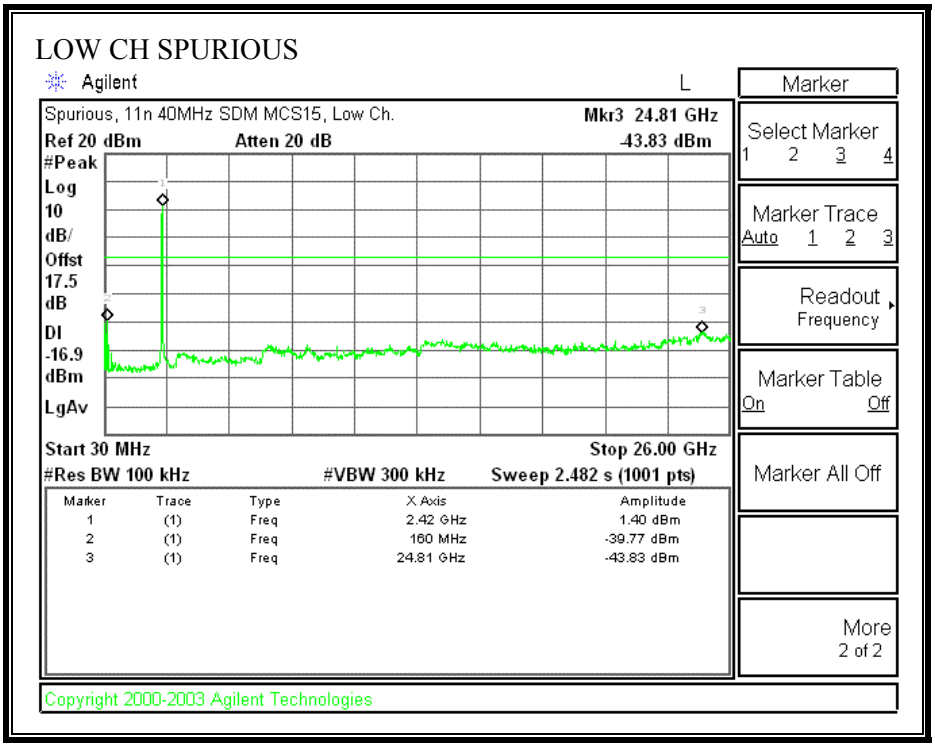


SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

LOW CH BANDEDGE, 2422 MHz

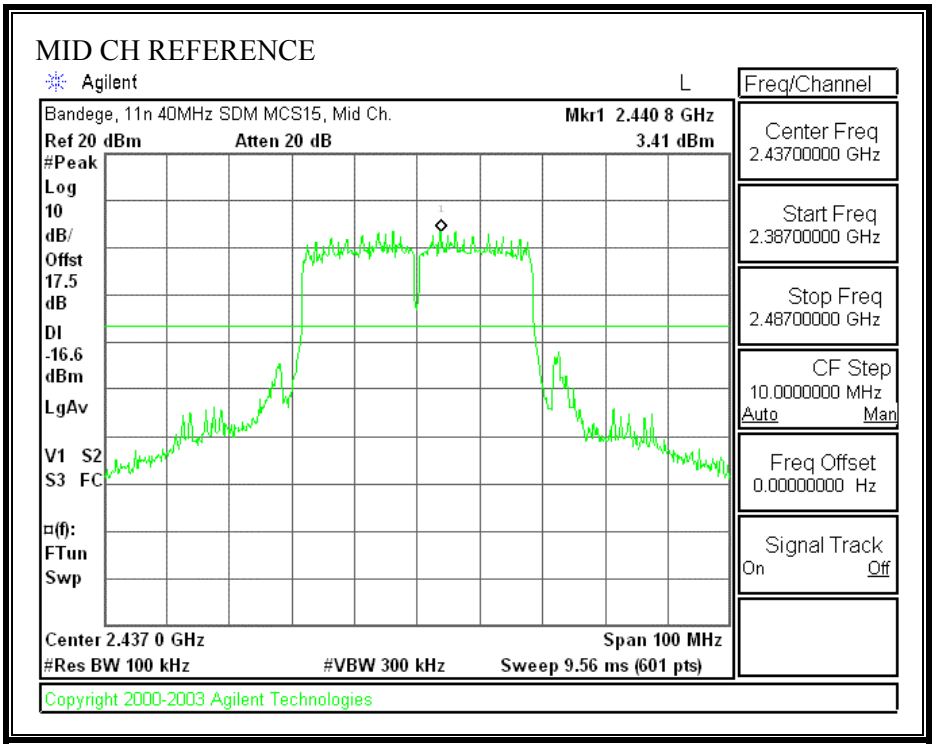


LOW CH SPURIOUS

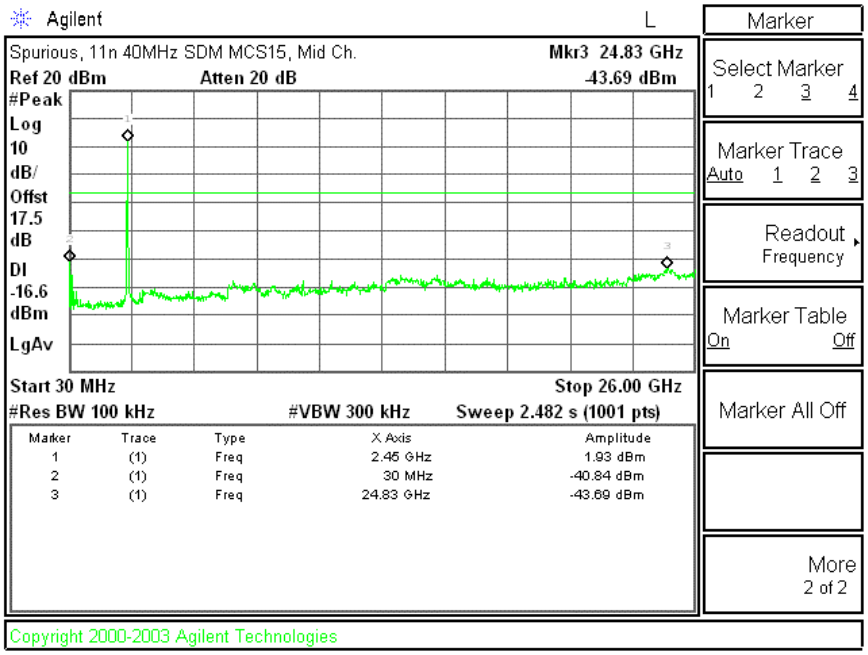


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

MID CH BANDEGE, 2437 MHz

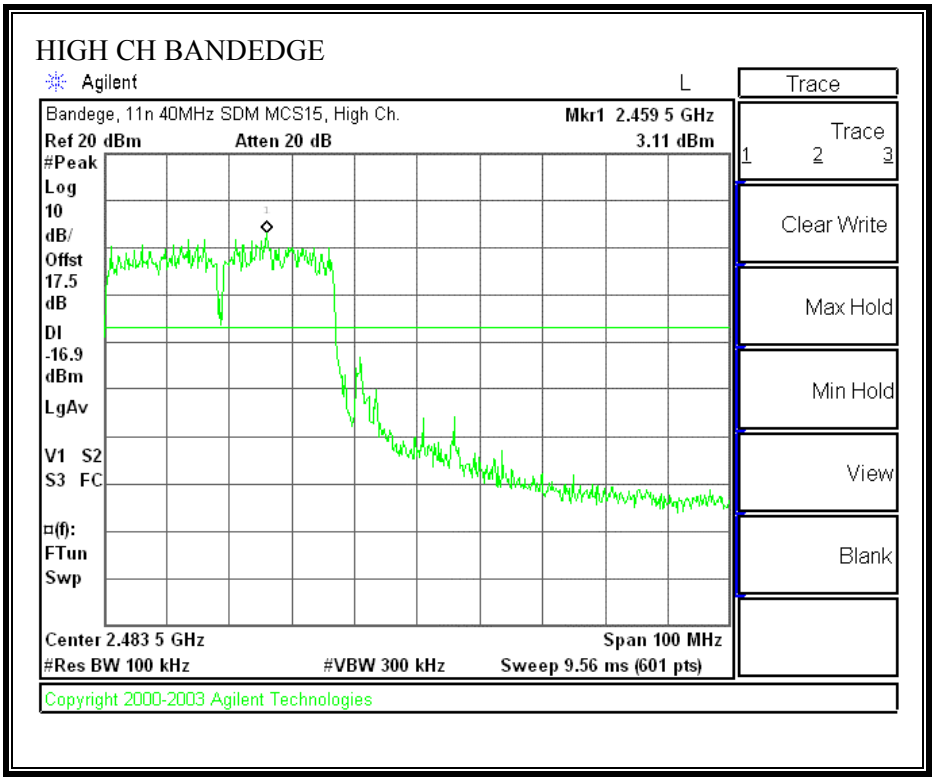


MID CH SPURIOUS

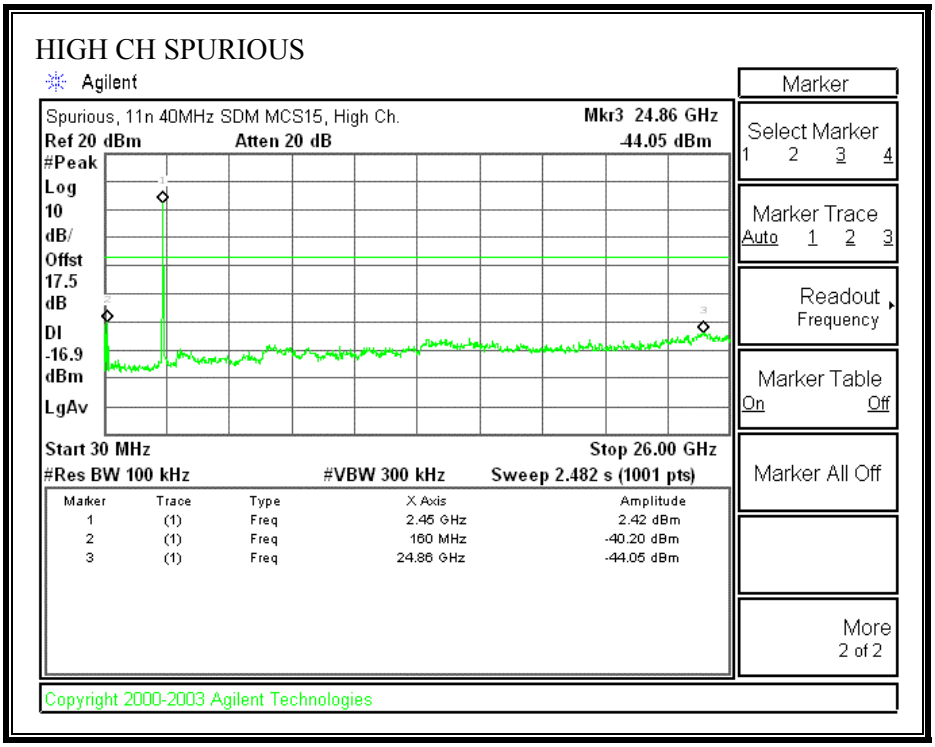


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

HIGH CH BANDEDGE, 2452 MHz



HIGH CH SPURIOUS



7.4. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

7.4.1. 6 dB BANDWIDTH

LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

6 dB BANDWIDTH

802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0

802.11n Mode 20 MHz CDD MCS0

20 MHz Tx BANDWIDTH - CHAIN 0

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5745	16250.00	500	15750
Middle	5785	16000.00	500	15500
High	5825	15750.00	500	15250

20 MHz Tx BANDWIDTH - CHAIN 1

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5745	16500	500	16000
Middle	5785	16750	500	16250
High	5825	16580	500	16080

802.11n Mode 40 MHz CDD MCS32

40 MHz Tz BANDWIDTH - CHAIN 0

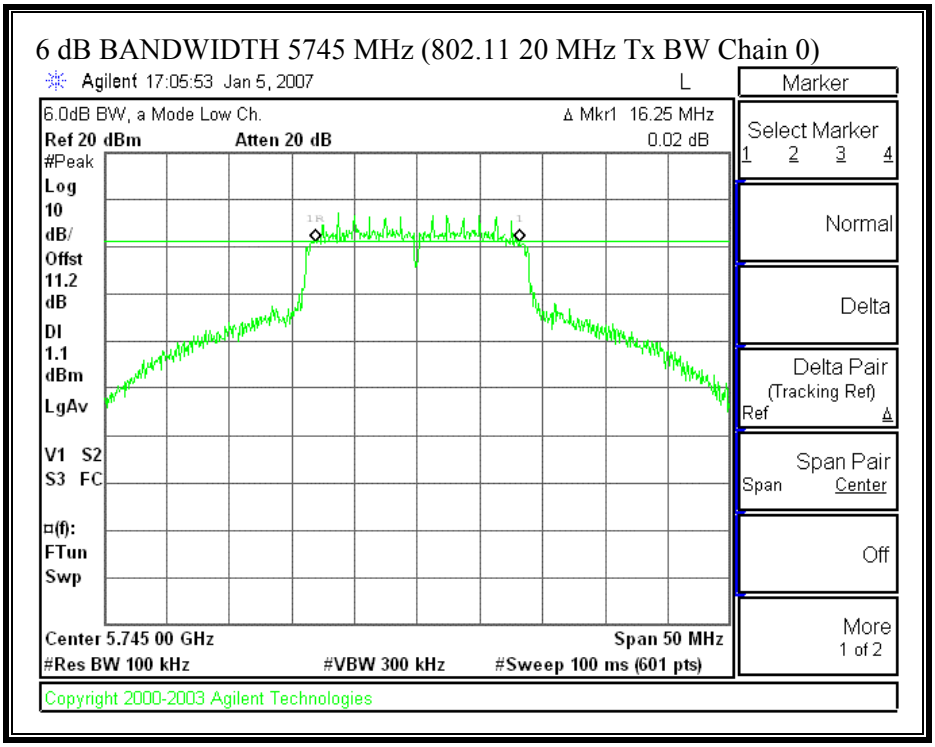
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
High	5755	35500	500	35000
High	5795	35250	500	34750

40 MHz Tx BANDWIDTH - CHAIN 1

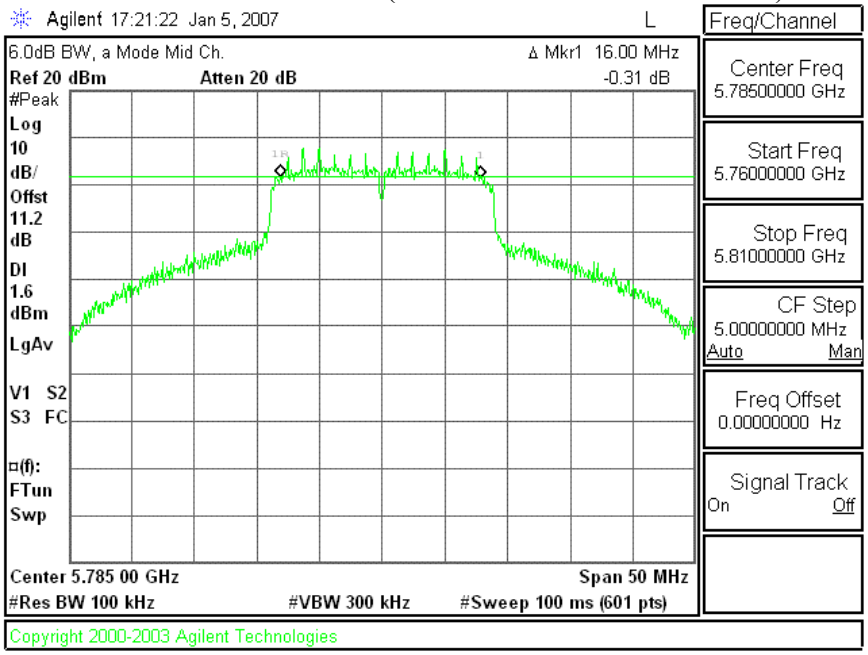
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
High	5755	35080	500	34580
High	5795	35750	500	35250

802.11n Mode 20 MHz CDD MCS0

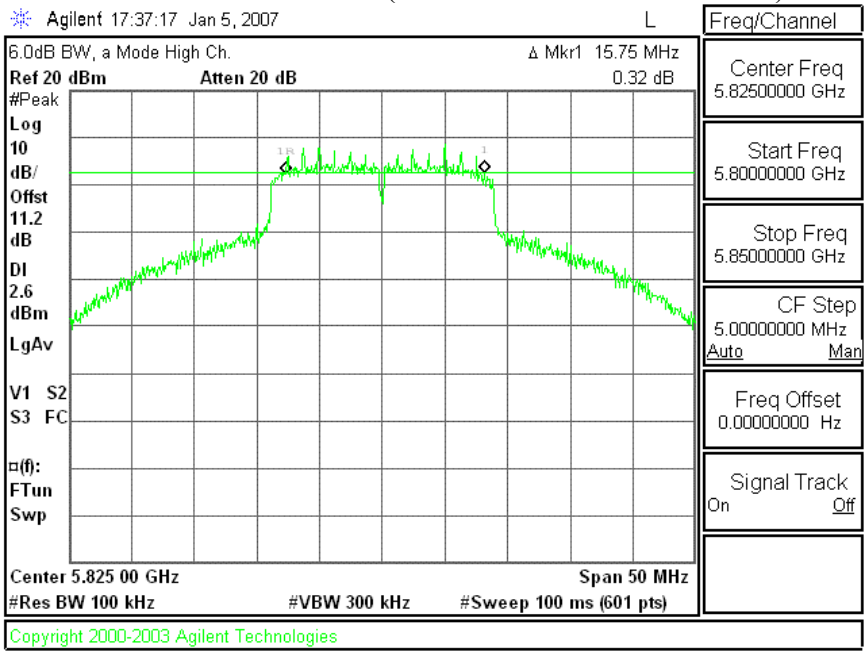
6 dB BANDWIDTH (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)



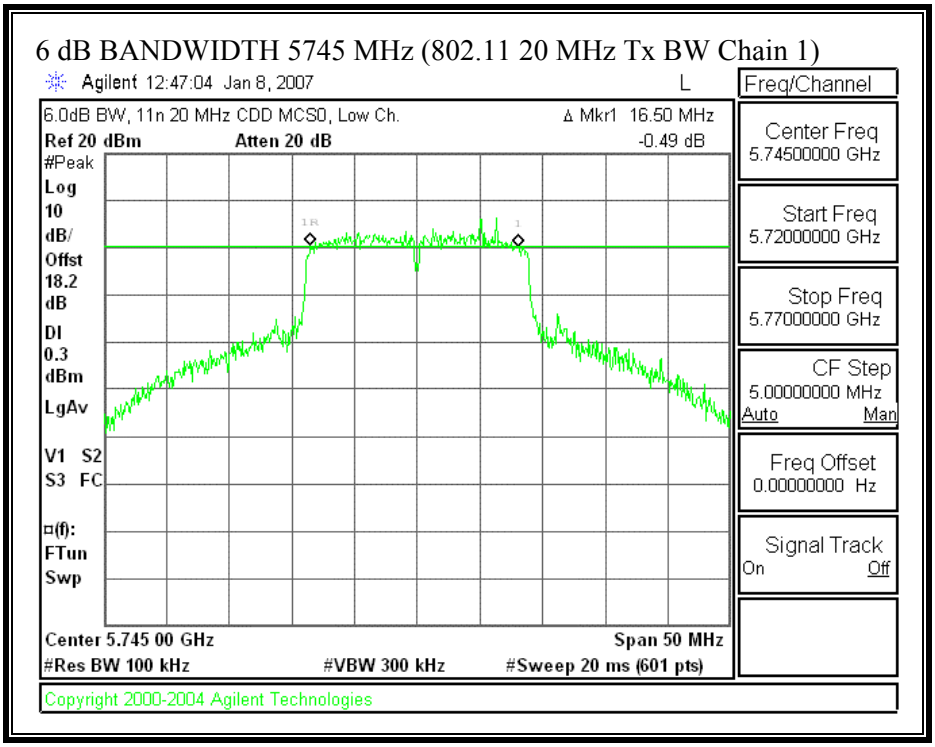
6 dB BANDWIDTH 5785 MHz (802.11 20 MHz Tx BW Chain 0)



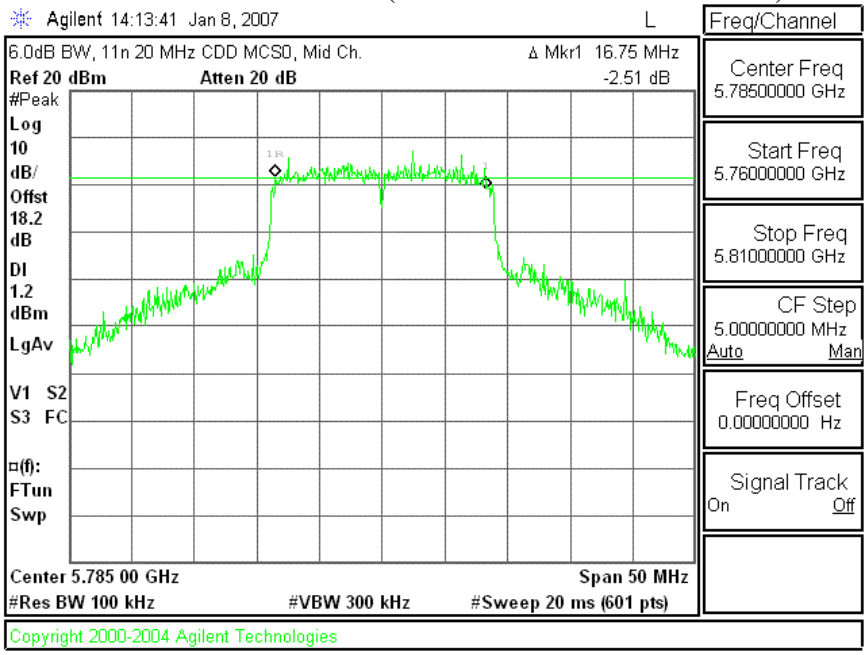
6 dB BANDWIDTH 5825 MHz (802.11 20 MHz Tx BW Chain 0)



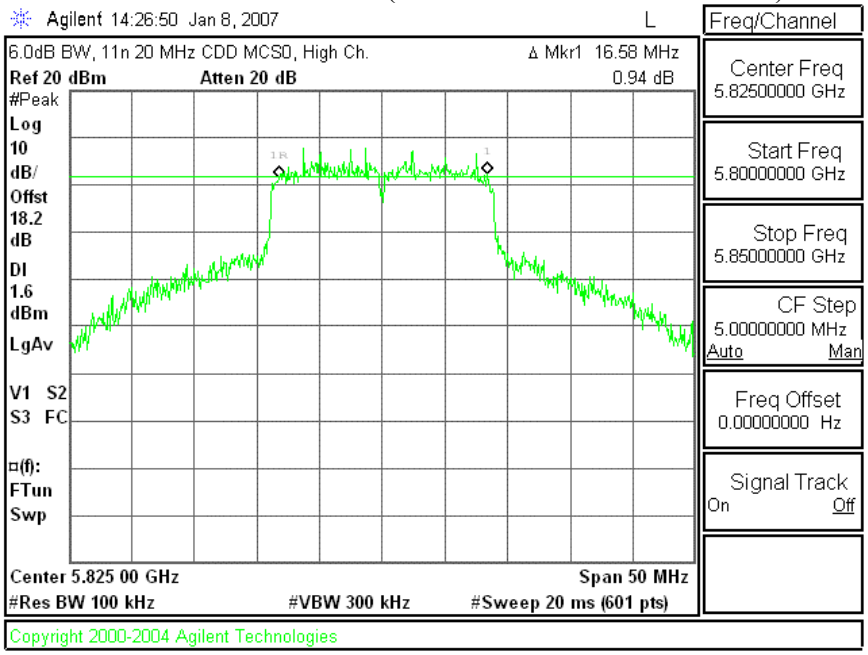
6 dB BANDWIDTH (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)



6 dB BANDWIDTH 5785 MHz (802.11 20 MHz Tx BW Chain 1)

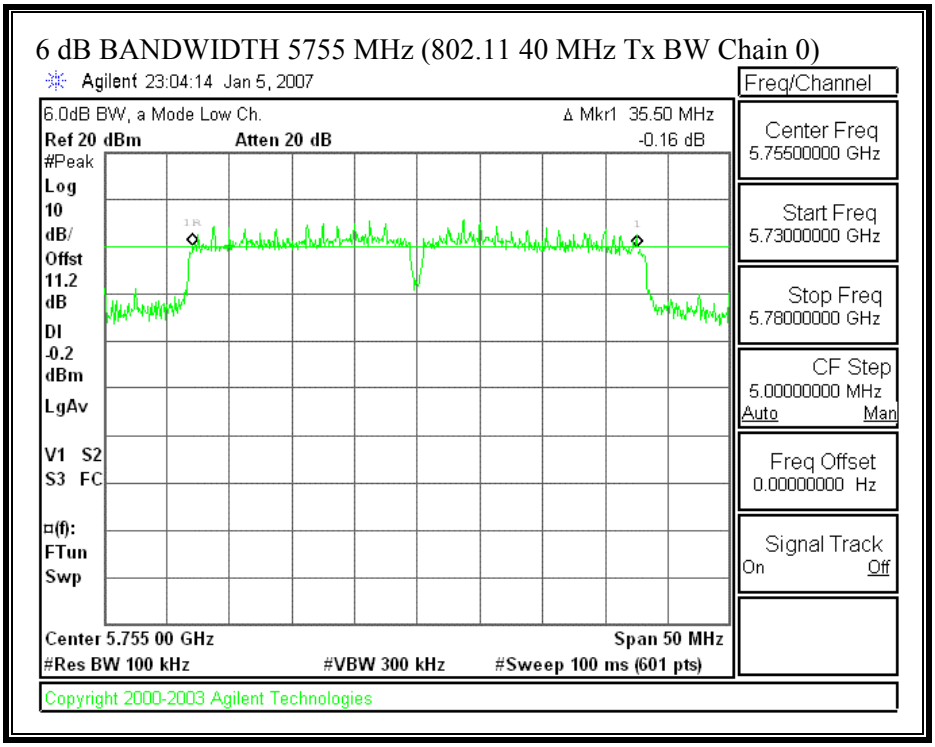


6 dB BANDWIDTH 5825 MHz (802.11 20 MHz Tx BW Chain 1)

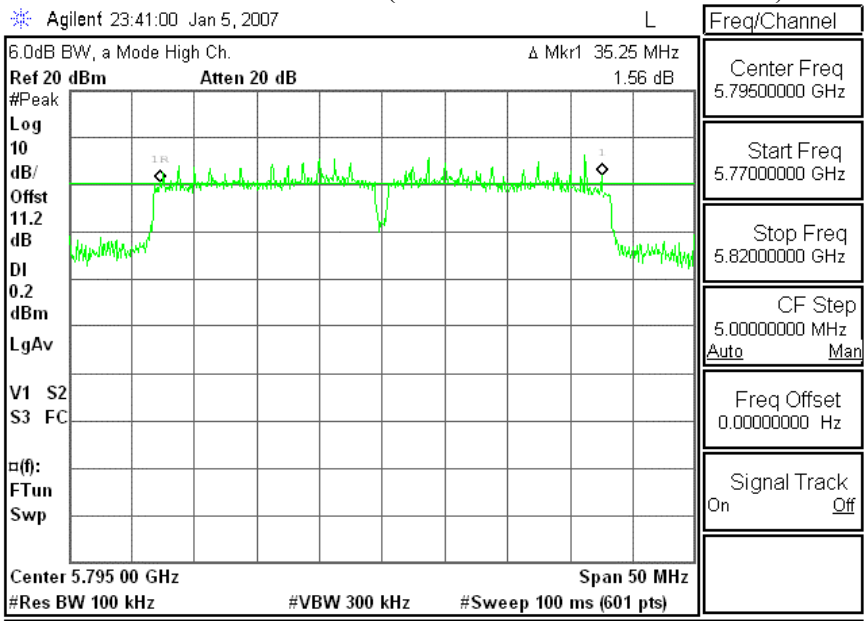


802.11n Mode 20 MHz CDD MCS0

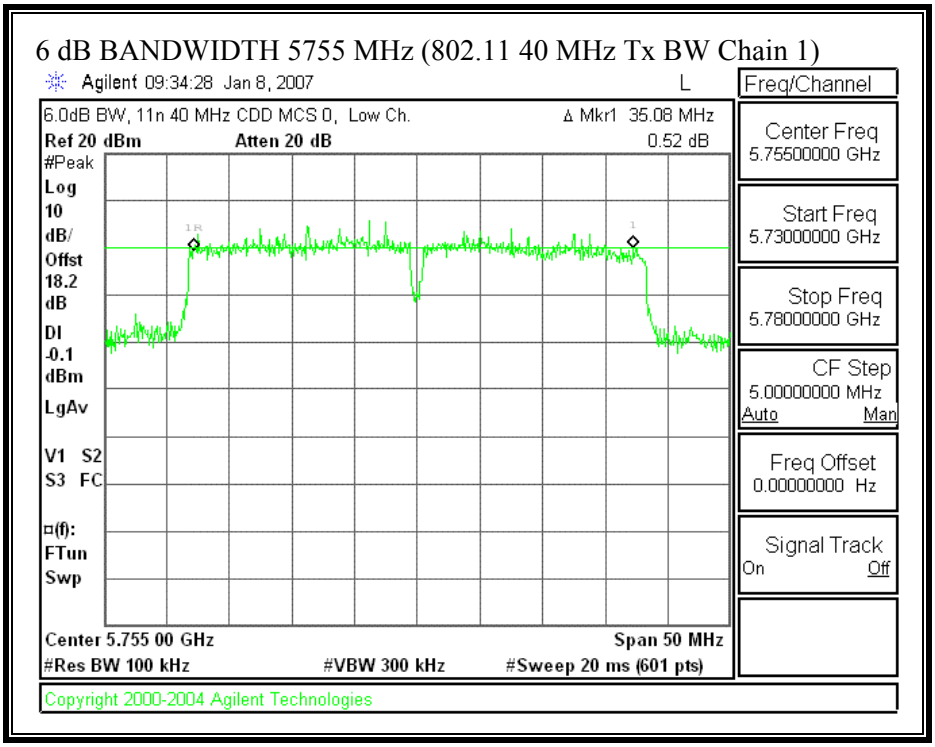
6 dB BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



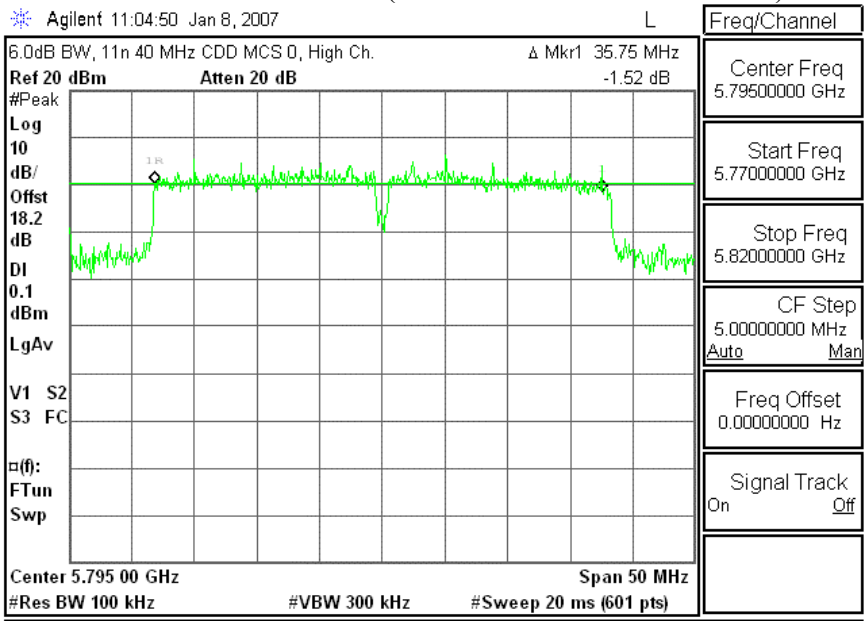
6 dB BANDWIDTH 5795 MHz (802.11 40 MHz Tx BW Chain 0)



6 dB BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



6 dB BANDWIDTH 5795 MHz (802.11 40 MHz Tx BW Chain 1)



7.4.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

99% BANDWIDTH

802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0

802.11n Mode 20 MHz CDD MCS0

20MHz Tx Bandwidth

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5745	17.6975	17.8519
Middle	5785	17.5387	17.7025
High	5825	17.9750	17.9946

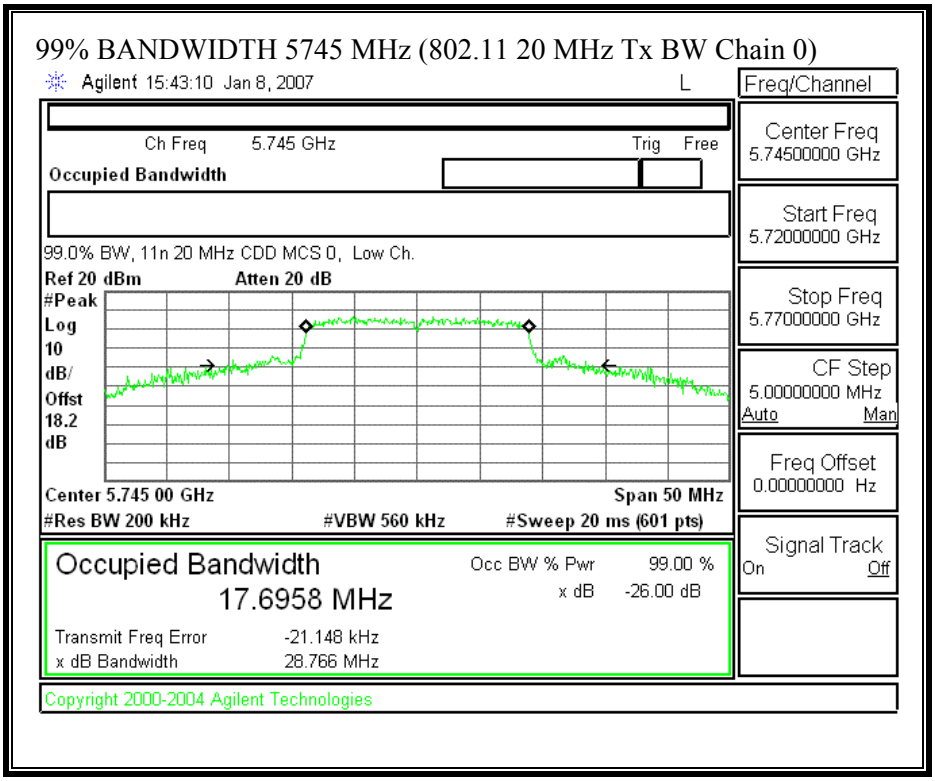
802.11n Mode 40 MHz CDD MCS 32

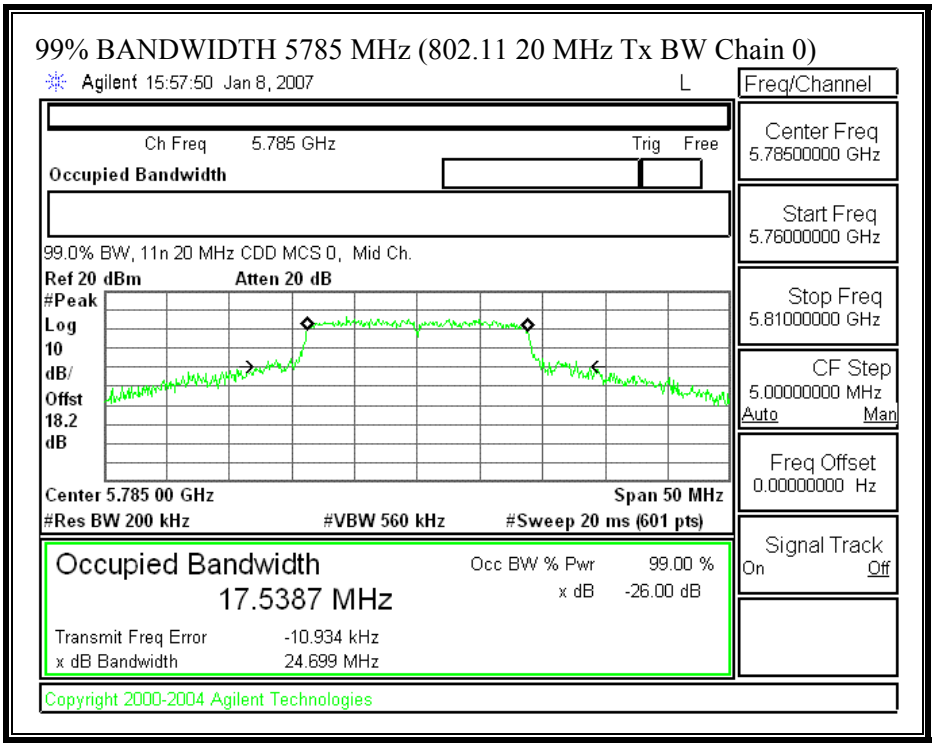
40MHz Tx Bandwidth

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5755	36.4470	36.2975
High	5795	37.9466	36.5798

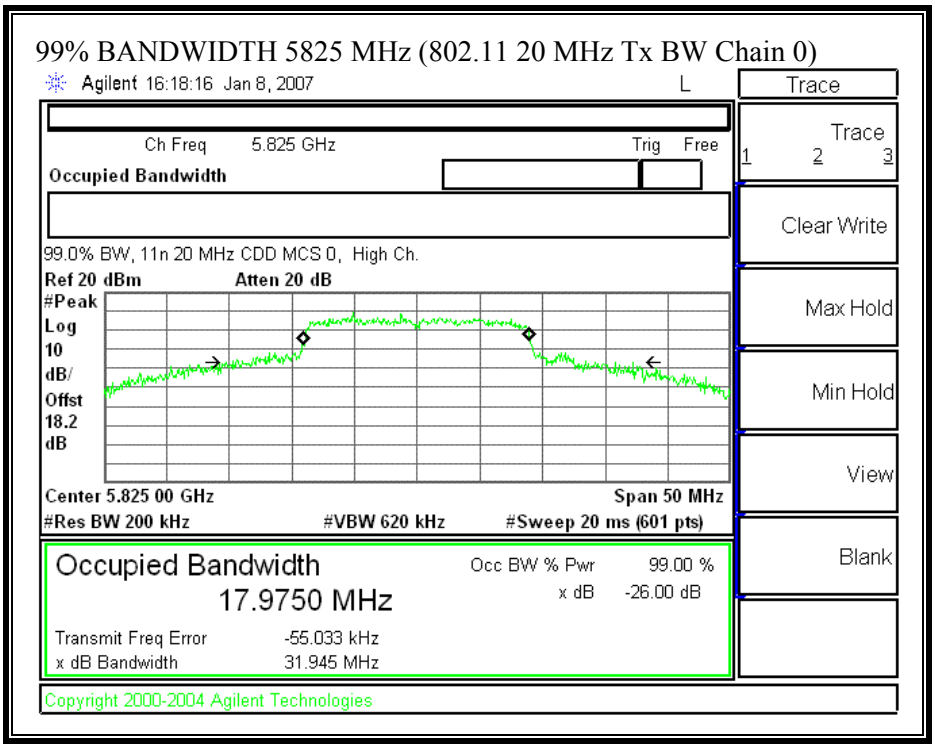
802.11n Mode 20 MHz CDD MCS0

99% BANDWIDTH (802.11 - 20 MHz Tx BANDWIDTH – CHAIN 0)

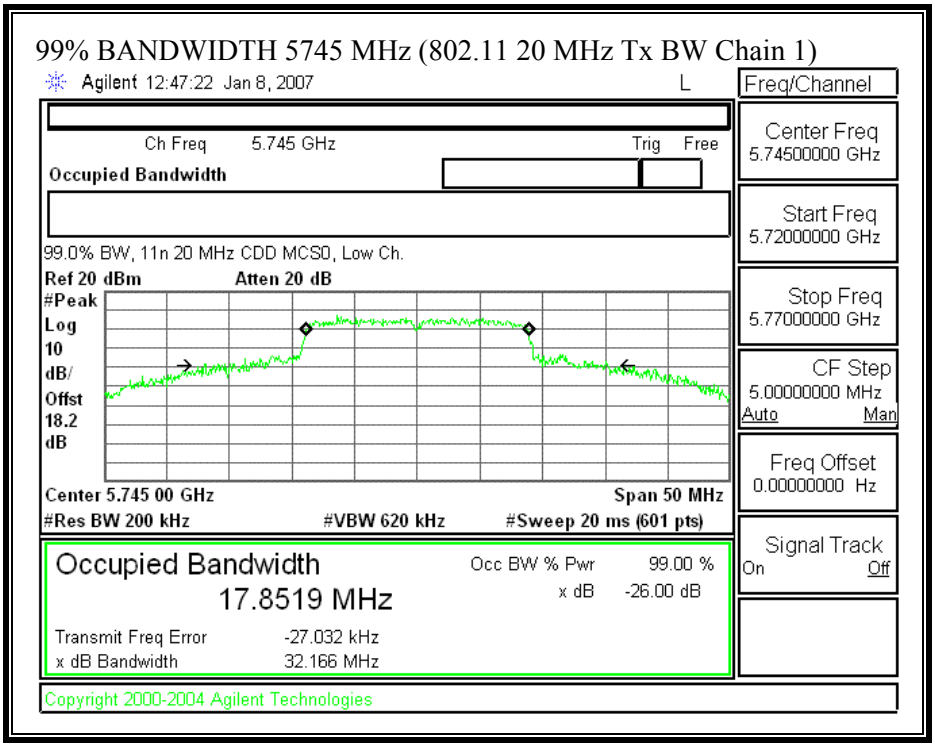


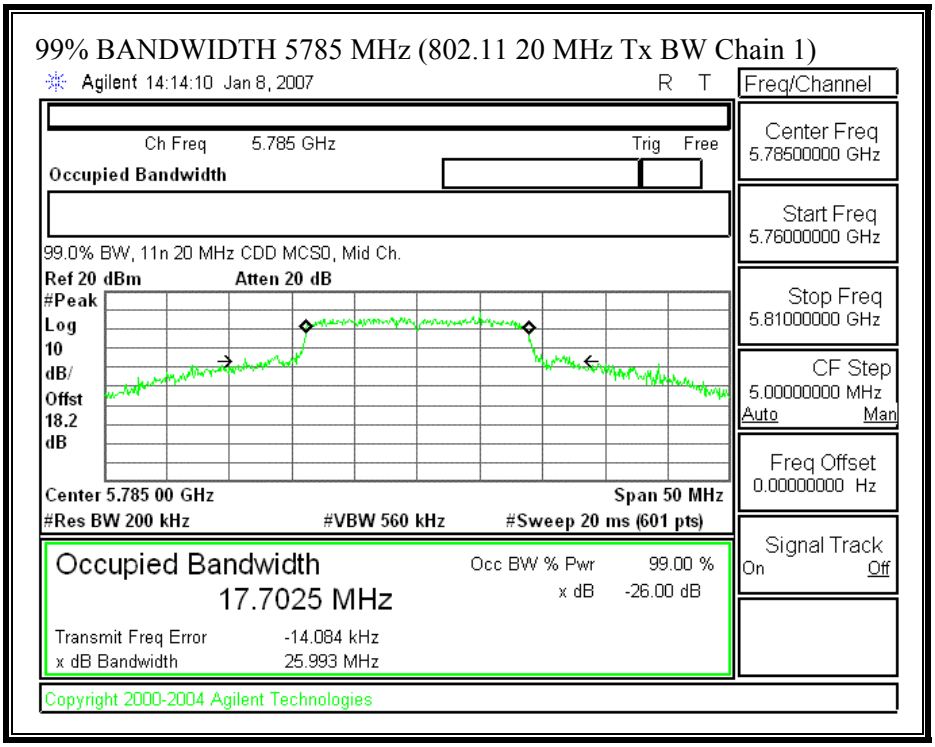


99% BANDWIDTH 5825 MHz (802.11 20 MHz Tx BW Chain 0)

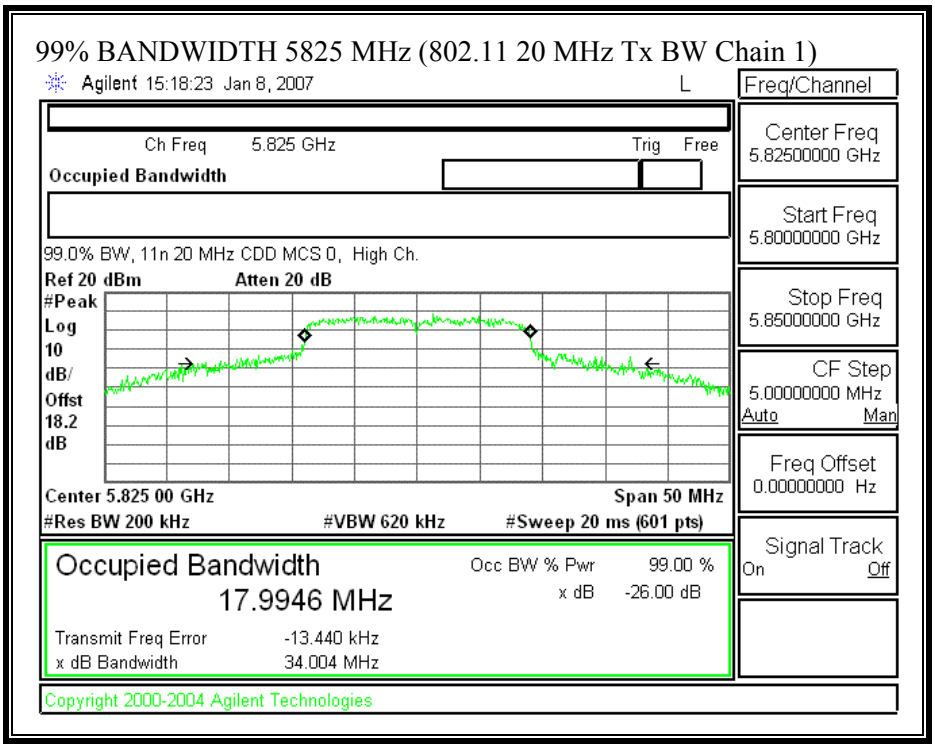


99% BANDWIDTH (802.11 - 20 MHz Tx BANDWIDTH – CHAIN 1)



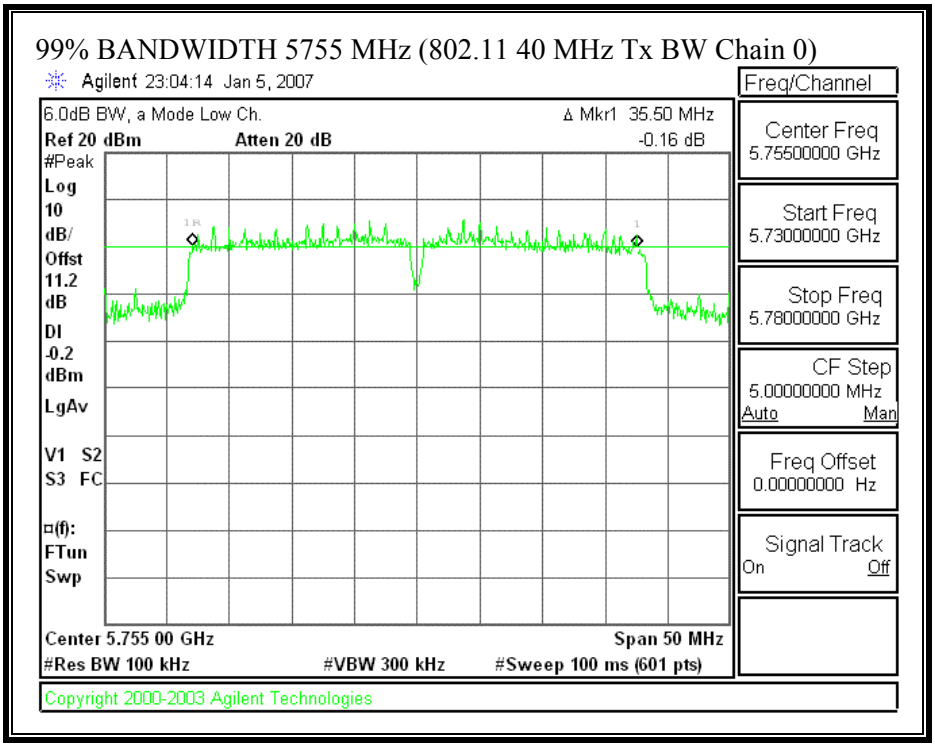


99% BANDWIDTH 5825 MHz (802.11 20 MHz Tx BW Chain 1)

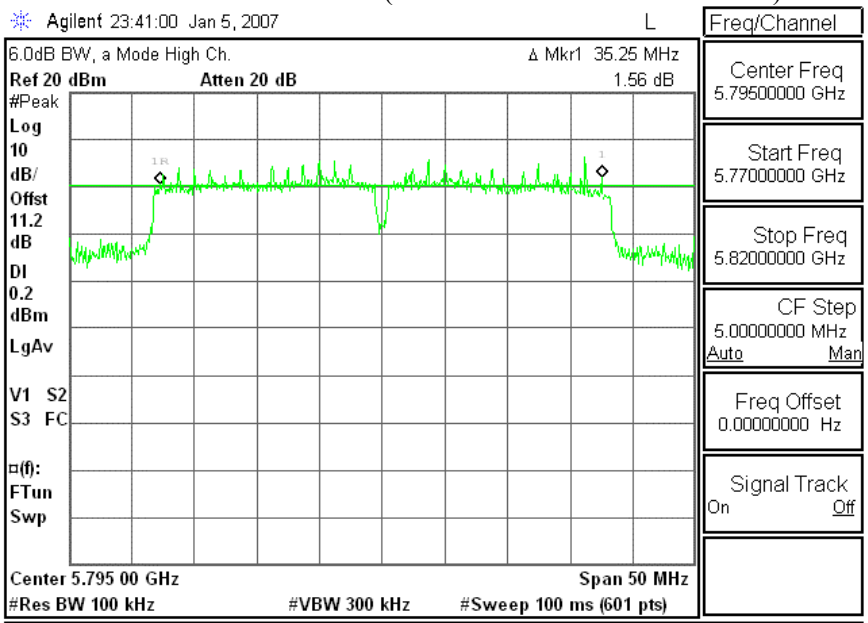


802.11n Mode 40 MHz CDD MCS32

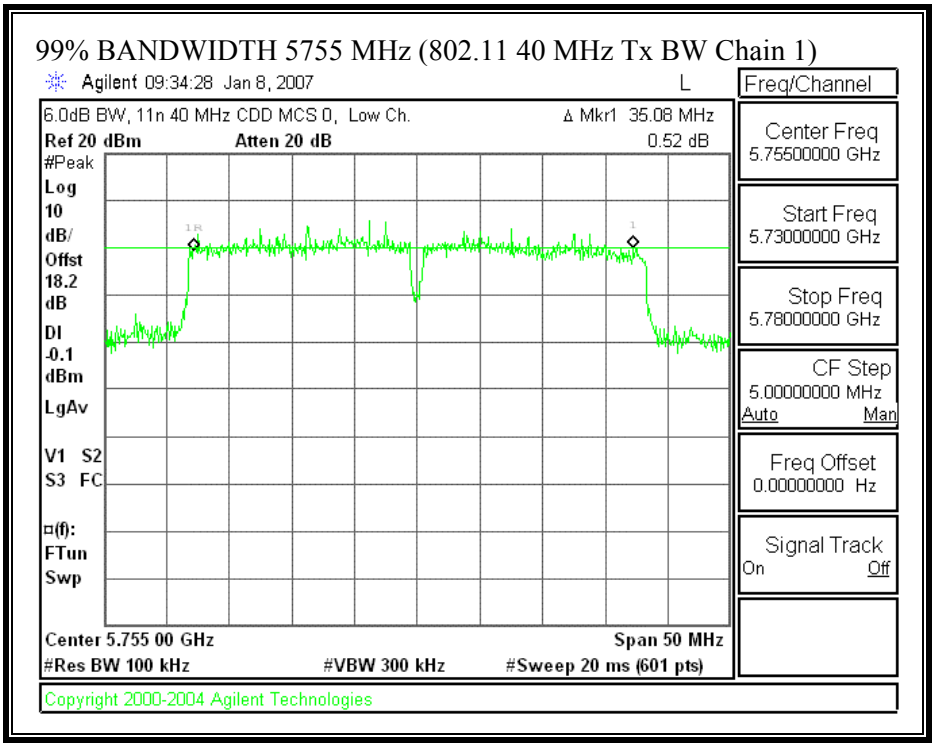
99% BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



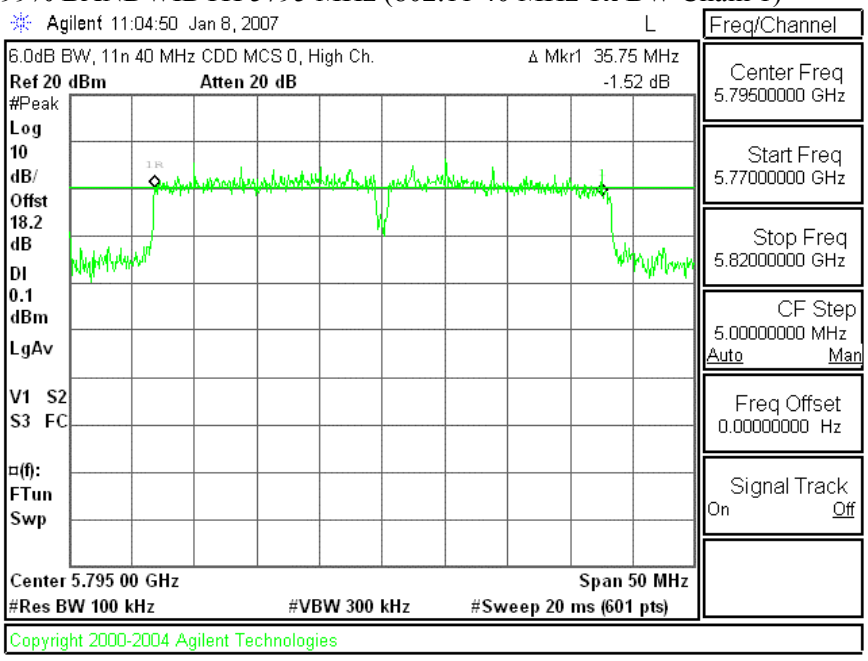
99% BANDWIDTH 5795 MHz (802.11 40 MHz Tx BW Chain 0)



99% BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



99% BANDWIDTH 5795 MHz (802.11 40 MHz Tx BW Chain 1)



7.4.3. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

Following formula to calculate the array gain:

Array gain = 10*log (10^ (main gain/10) + 10^ (aux gain/10))

2.4GHz band: 5.948 dBi
5.8GHz band: 8.084 dBi

RESULTS,

The maximum antenna gain is 8.084dBi for other than fixed, point-to-point operations, therefore the limit is 27.92dBm.

Total peak power calculation formula: 10 log (10^ (Pchain0 / 10) + 10^ (Pchain1 / 10))

Note: Pchain 0 and Pchain1 are in dBm

No non-compliance noted:

802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0

802.11n Mode 20 MHz CDD MCS0

CHAIN 0 & CHAIN 1

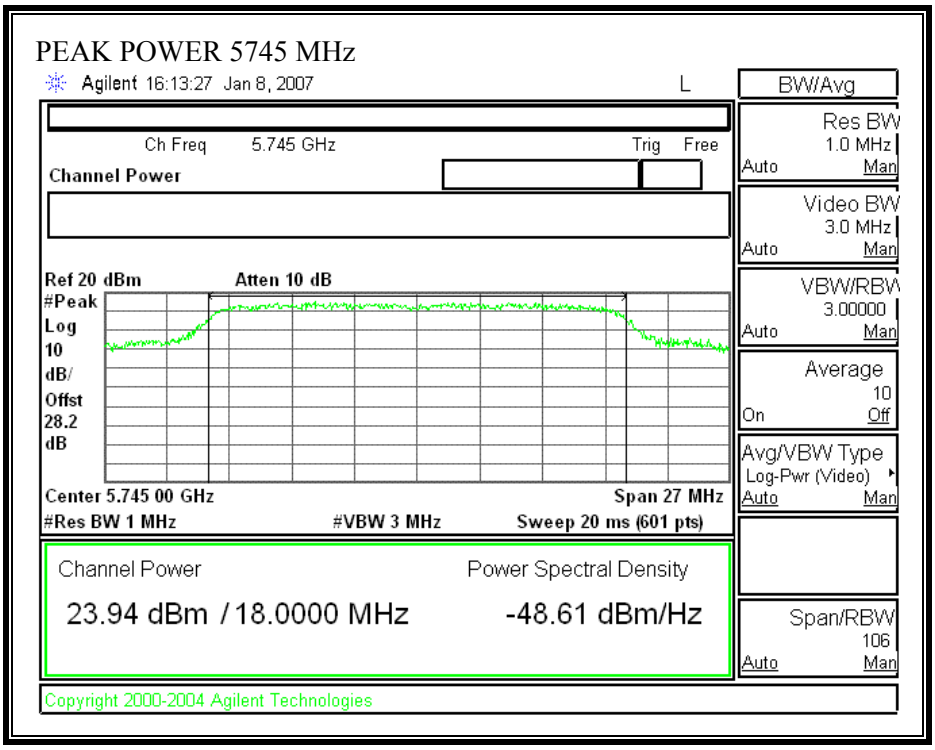
Channel	Frequency (MHz)	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Peak Power Total (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.94	23.82	26.89	27.9	-1.03
Middle	5785	24.58	24.46	27.53	27.9	-0.39
High	5825	24.89	24.69	27.80	27.9	-0.12

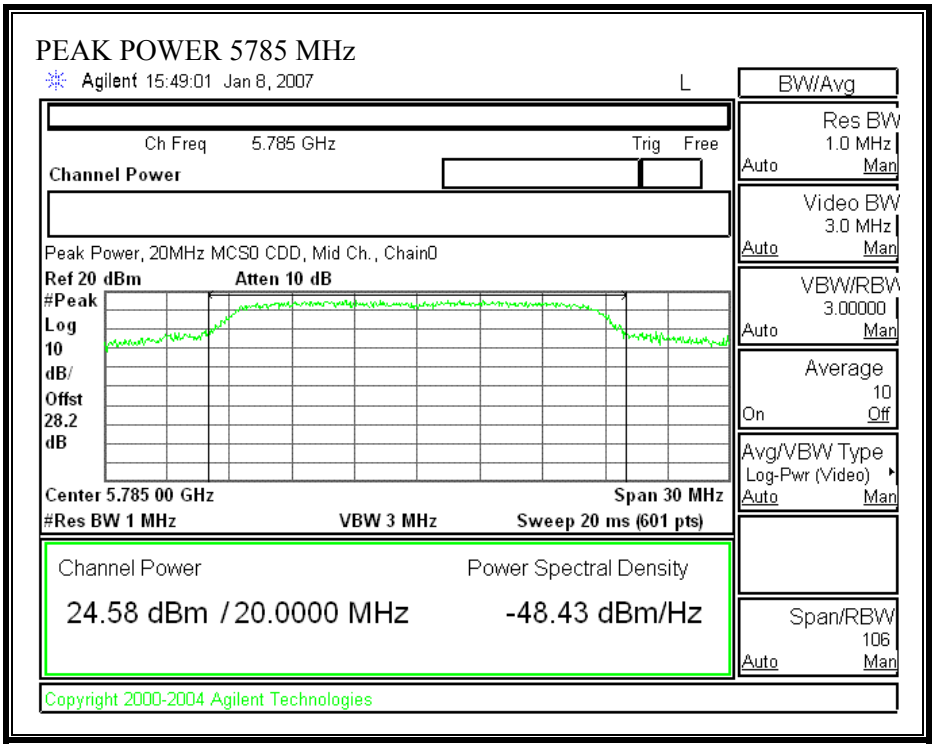
802.11n Mode 40 MHz CDD MCS32

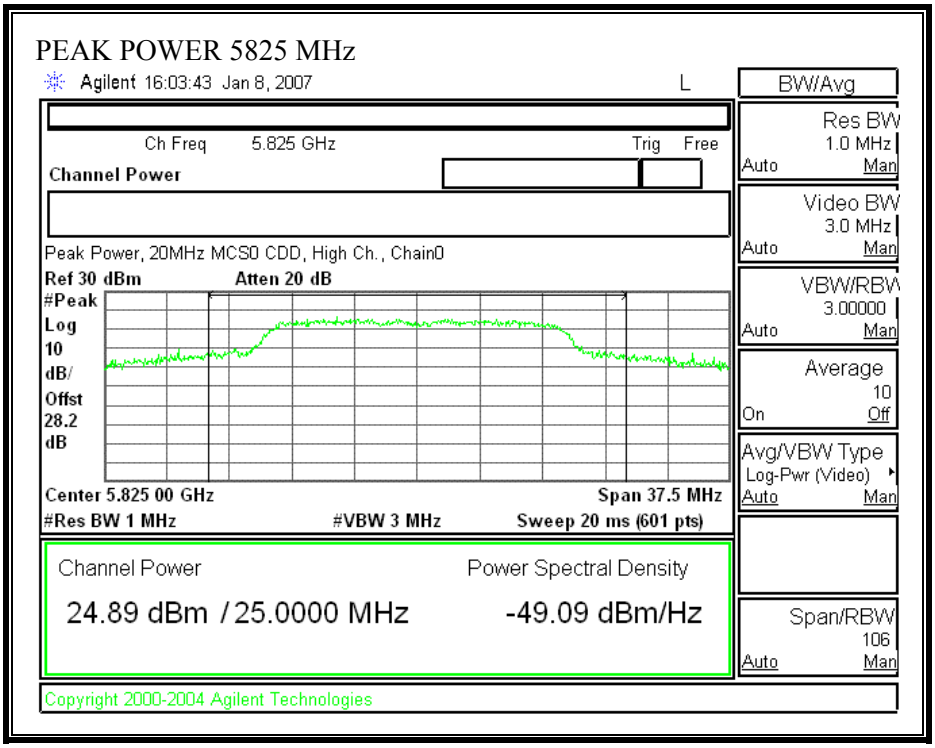
Channel	Frequency (MHz)	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Peak Power Total (dBm)	Limit (dBm)	Margin (dB)
CHAIN 0 & CHAIN 1						
Low	5755	25.18	25.19	28.20	27.9	0.28
High	5795	25.53	25.56	28.56	27.9	0.64

802.11n Mode 20 MHz CDD MCS0

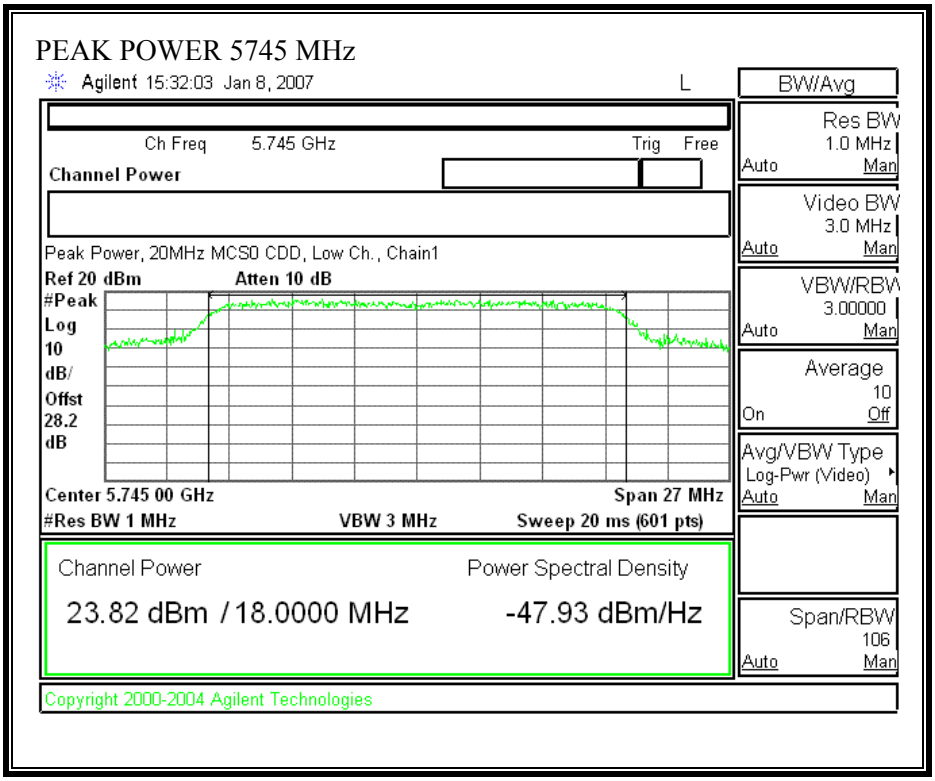
OUTPUT POWER (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

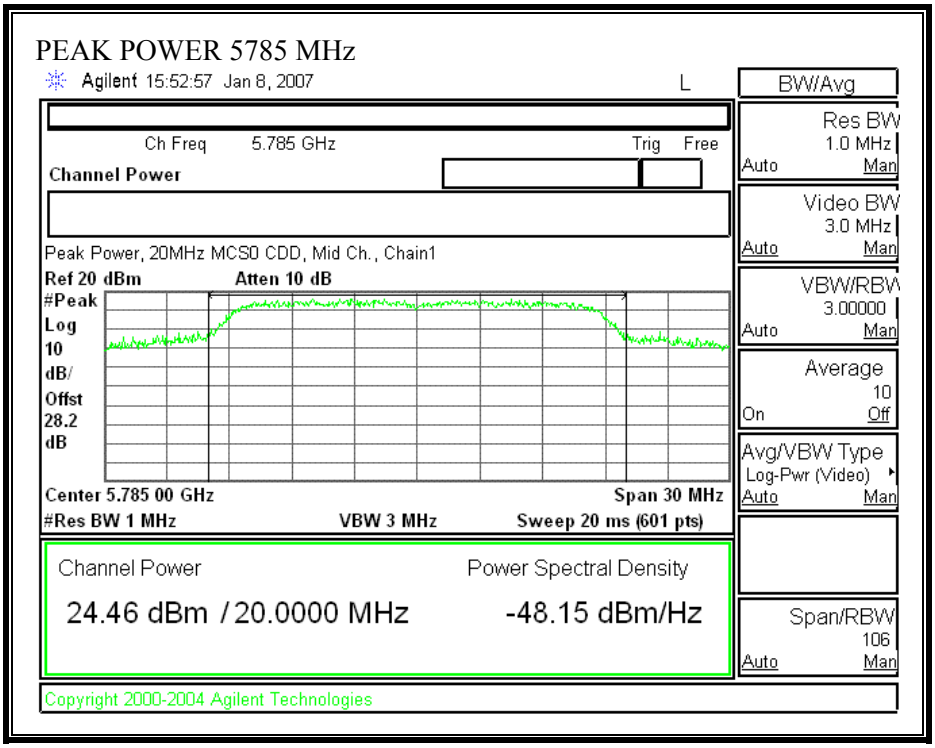


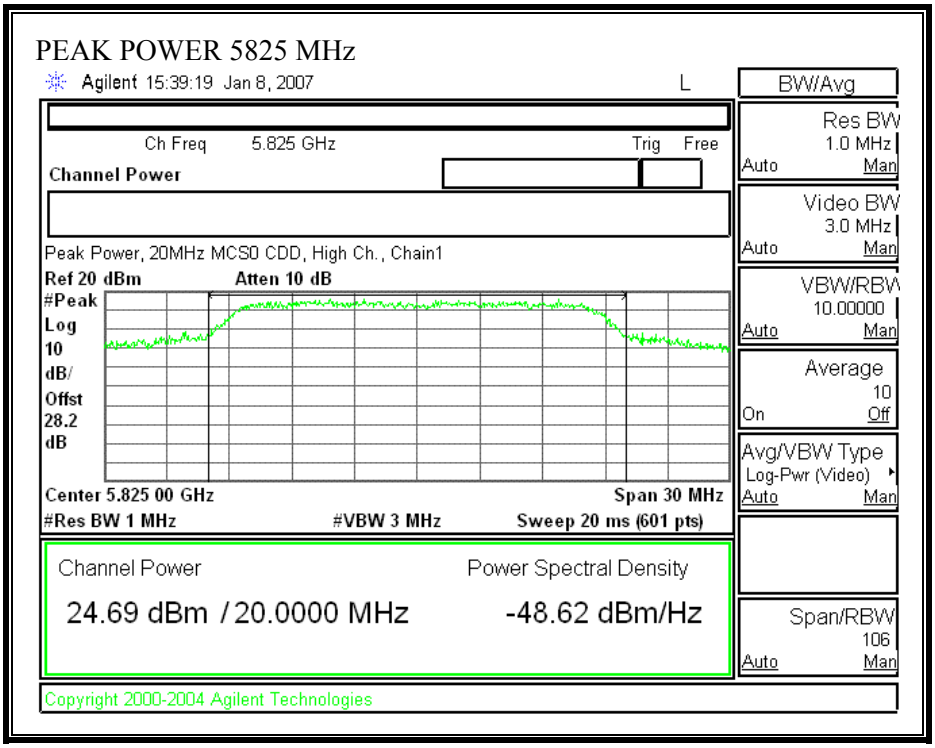




OUTPUT POWER (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

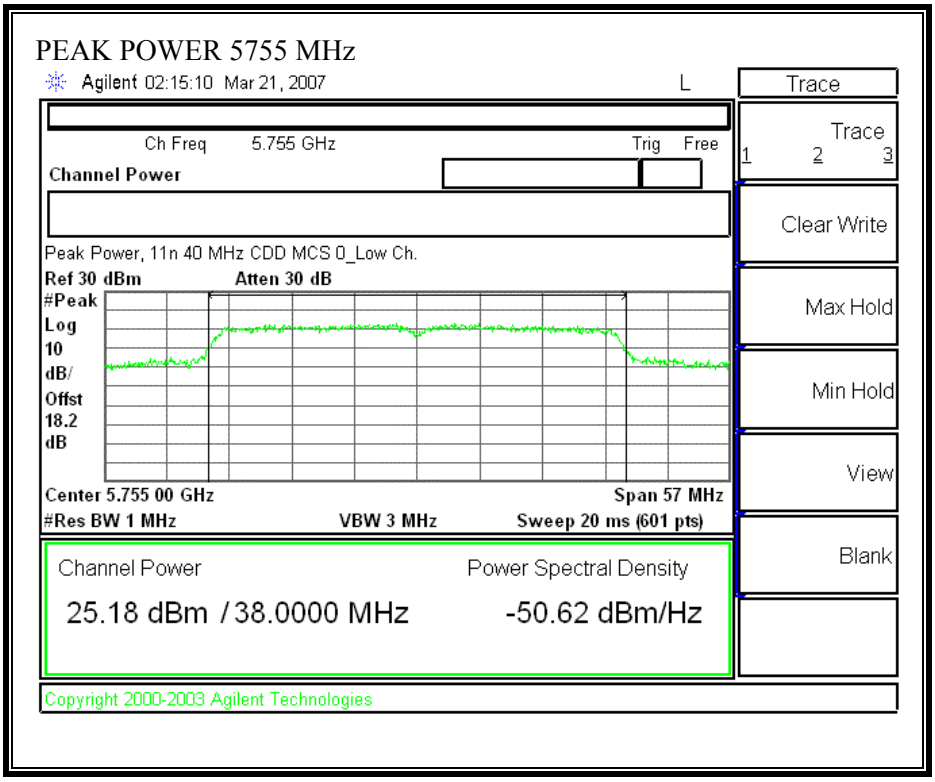


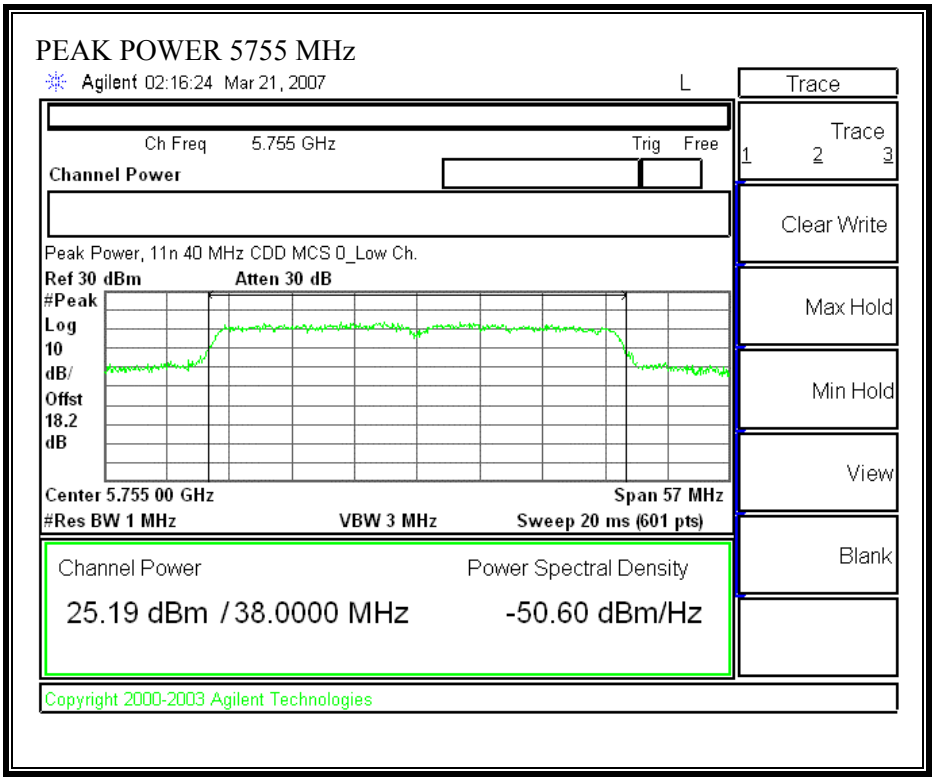




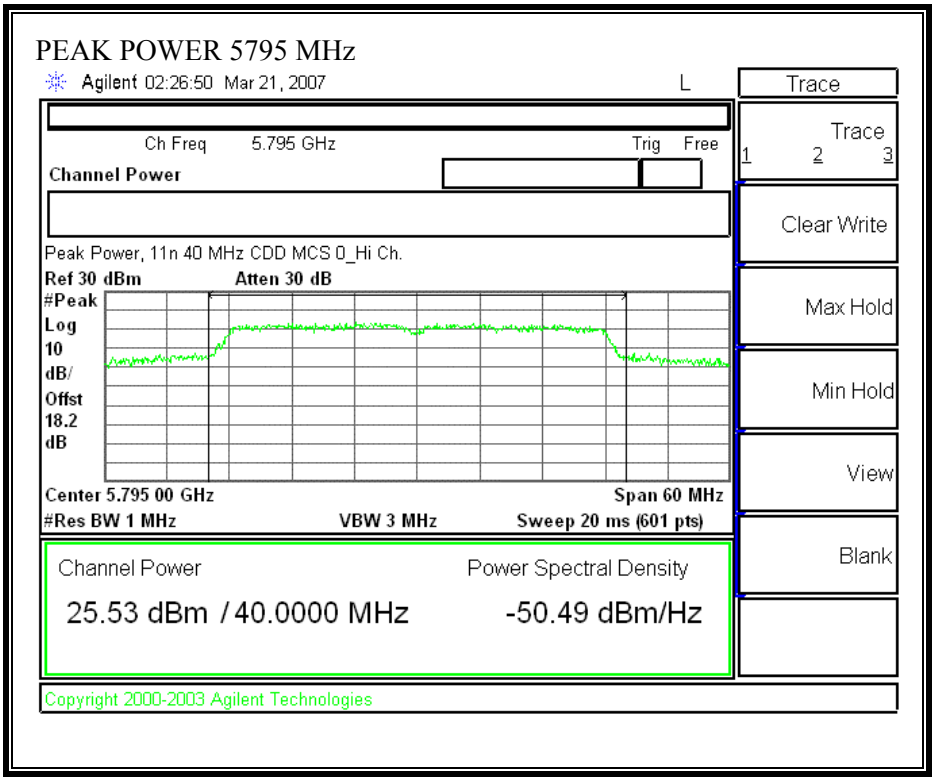
802.11n Mode 40 MHz CDD MCS32

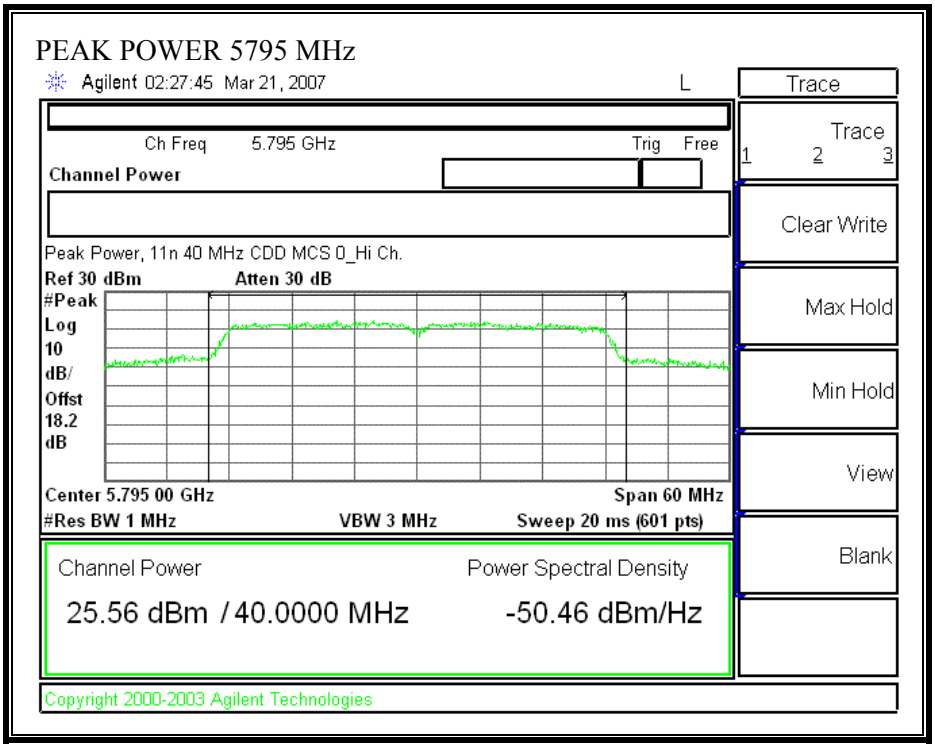
OUTPUT POWER (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)





OUTPUT POWER (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)





7.4.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

E = √ (30 * P * G) / d

and

S = E ^ 2 / 3770

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

d = √ ((30 * P * G) / (3770 * S))

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

d = 100 * √ ((30 * (P / 1000) * G) / (3770 * S))
d = 0.282 * √ (P * G / S)

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

d = 0.282 * 10 ^ ((P + G) / 20) / √ S

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2 in the 5.8 GHz band.

RESULTS

No non-compliance noted

RESULTS

No non-compliance noted

Mode	MPE Distance (cm)	Total Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 20MHz CDD	20.0	27.80	8.04	0.76
802.11n 40MHz CDD	20.0	28.39	8.04	0.87

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.4.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

RESULTS

No non-compliance noted:

802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0

802.11n Mode20 MHz CDD MCS0

11n 20 MHz MCS 0

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-7.56	-5.27	-3.26	8	-11.26
Middle	5785	-7.60	-6.58	-4.05	8	-12.05
High	5825	-7.09	-6.56	-3.81	8	-11.81

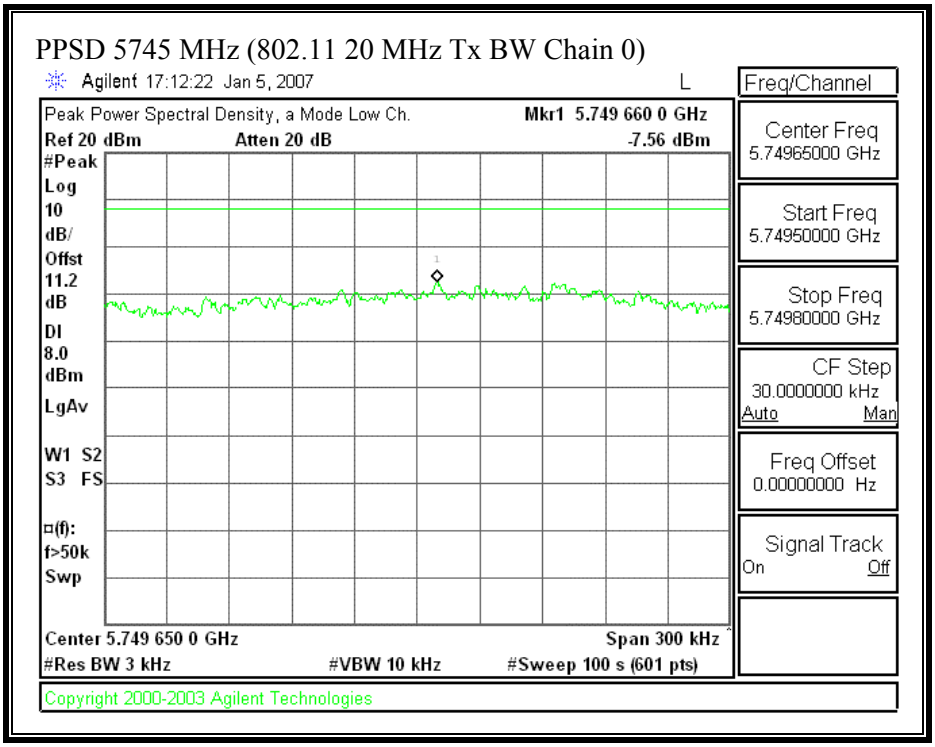
802.11n 40 MHz CDD MCS32

11n 40 MHz MCS 0

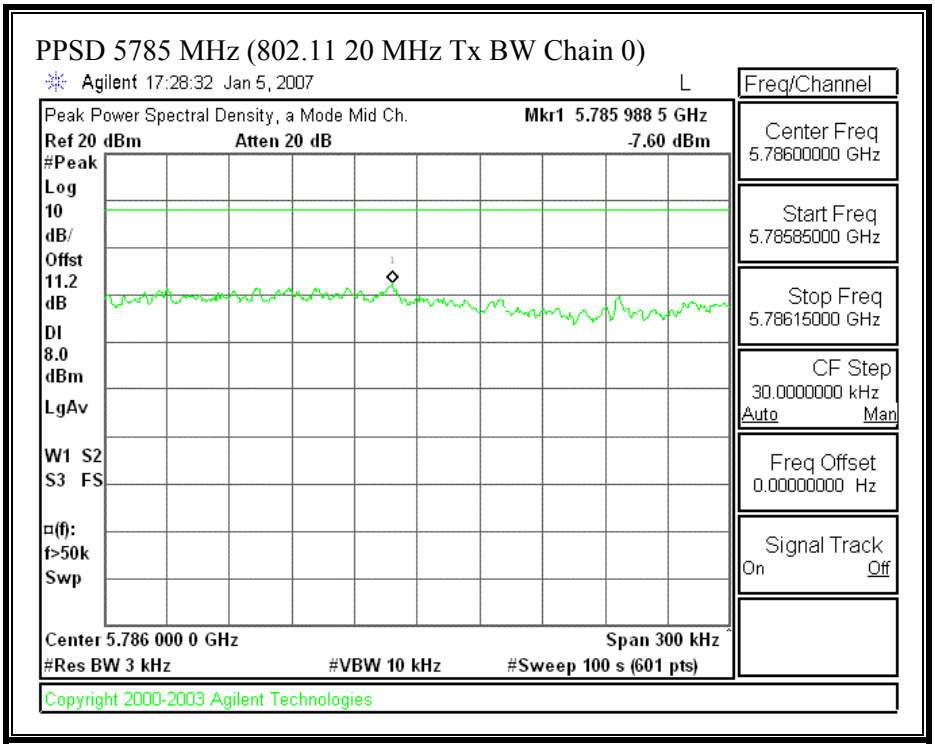
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-7.40	-8.28	-4.81	8	-12.81
High	5795	-10.09	-8.10	-5.97	8	-13.97

802.11n Mode20 MHz CDD MCS0

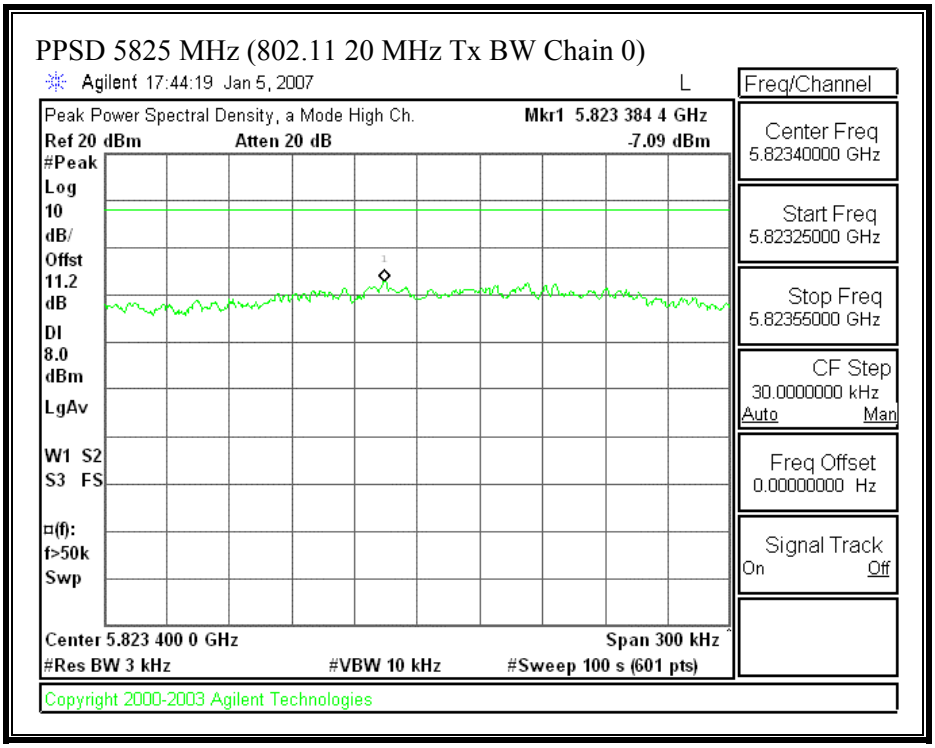
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)



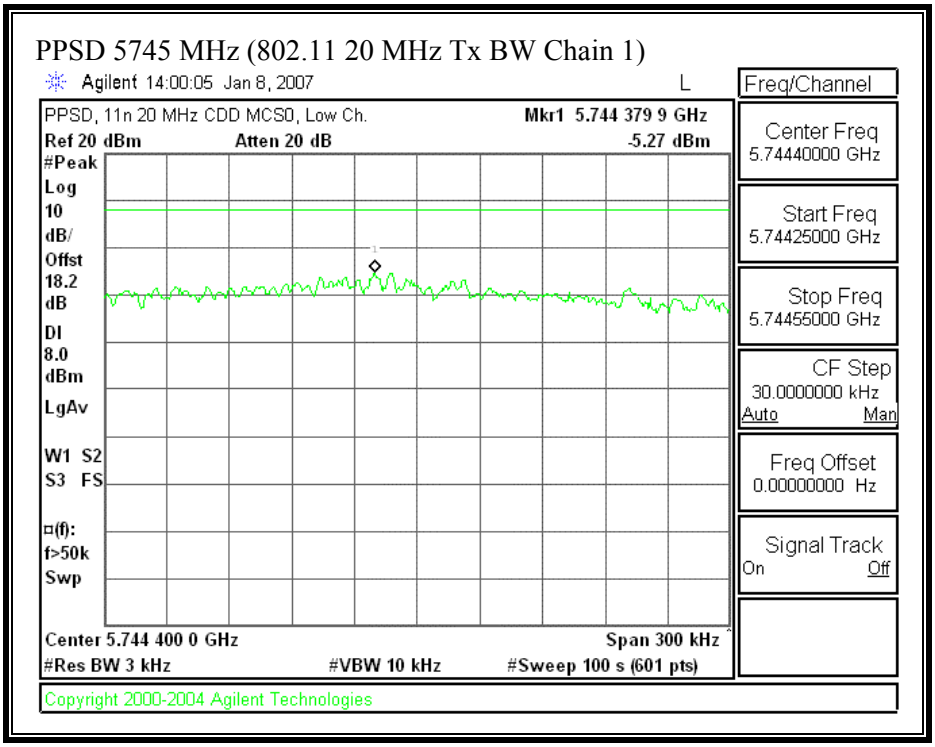
PPSD 5785 MHz (802.11 20 MHz Tx BW Chain 0)



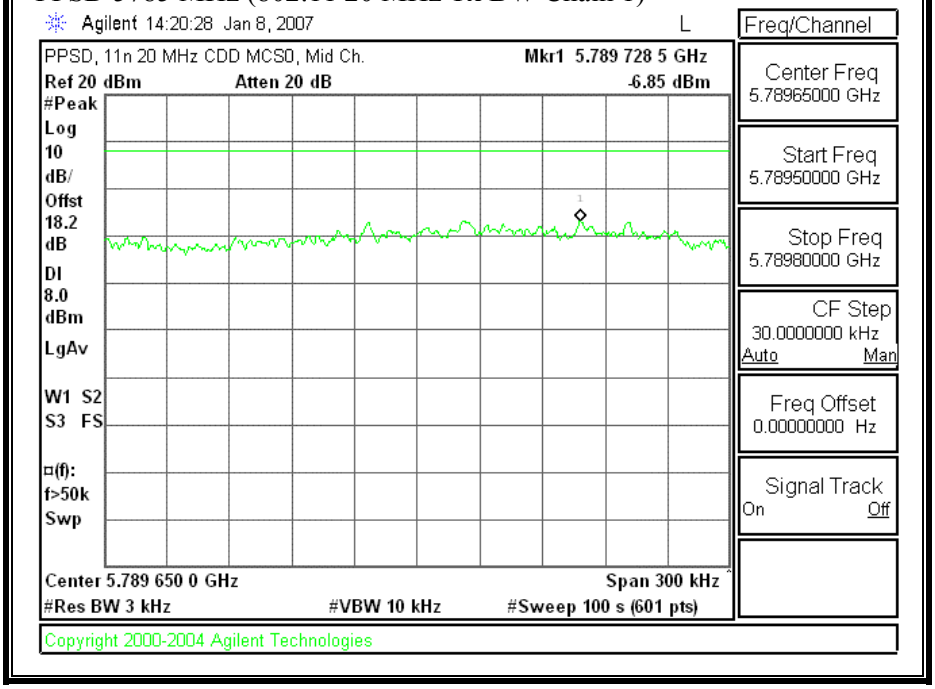
PPSD 5825 MHz (802.11 20 MHz Tx BW Chain 0)



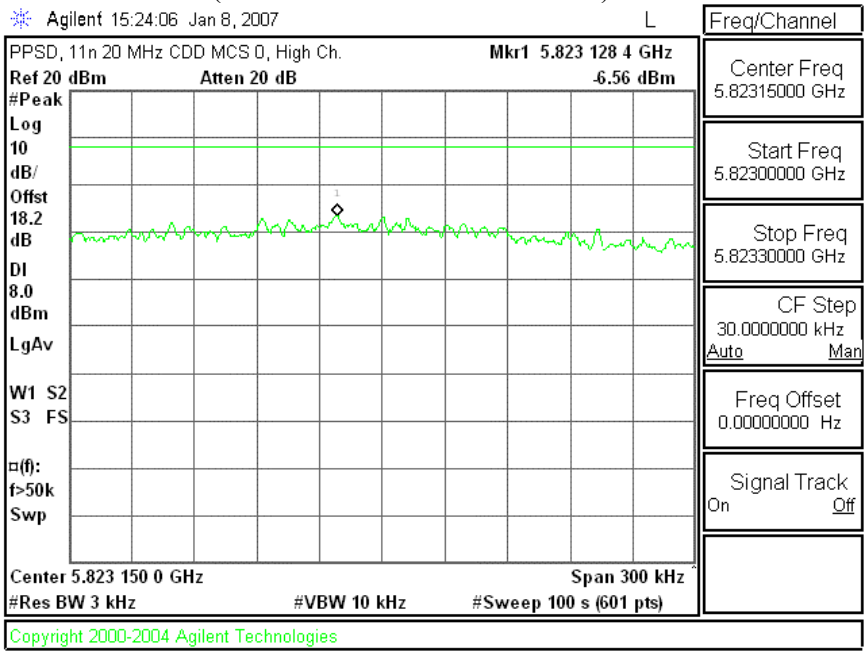
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)



PPSD 5785 MHz (802.11 20 MHz Tx BW Chain 1)

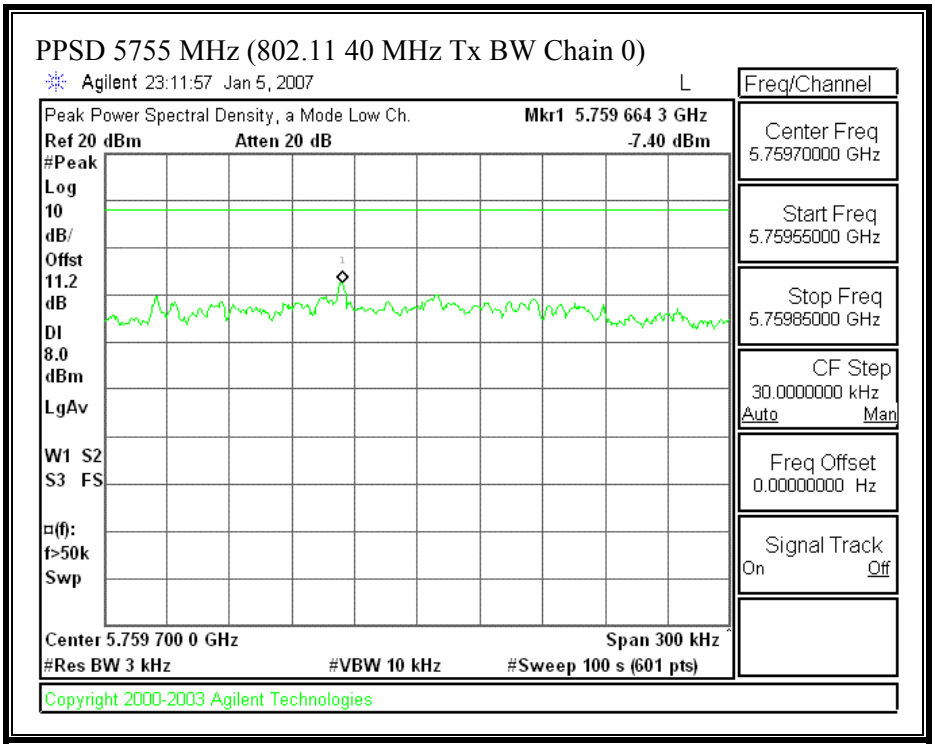


PPSD 5825 MHz (802.11 20 MHz Tx BW Chain 1)

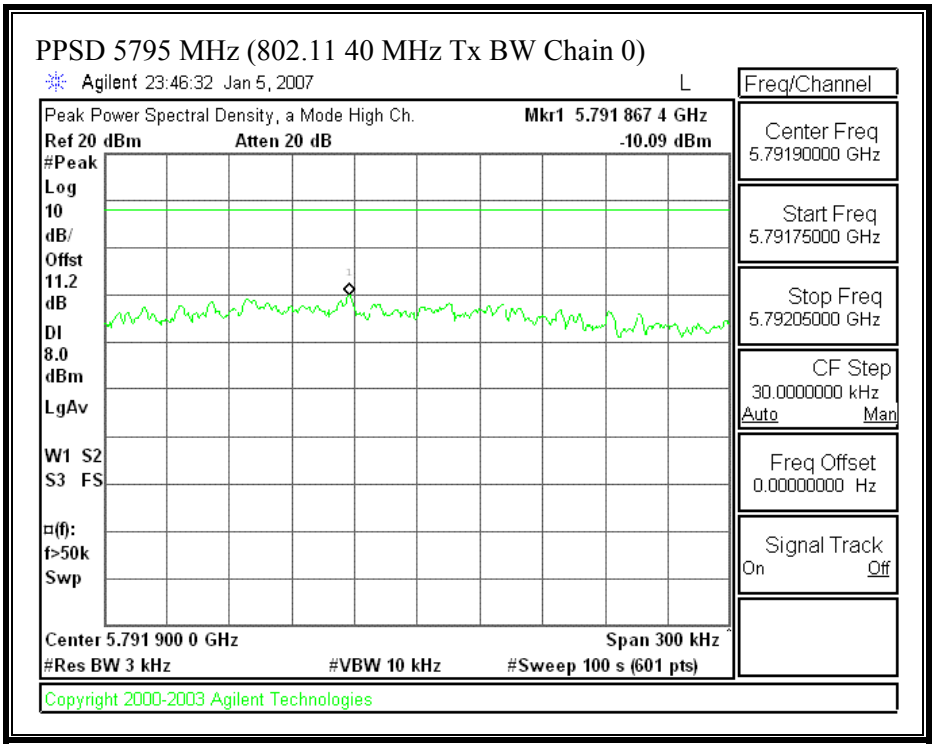


802.11n Mode40 MHz CDD MCS32

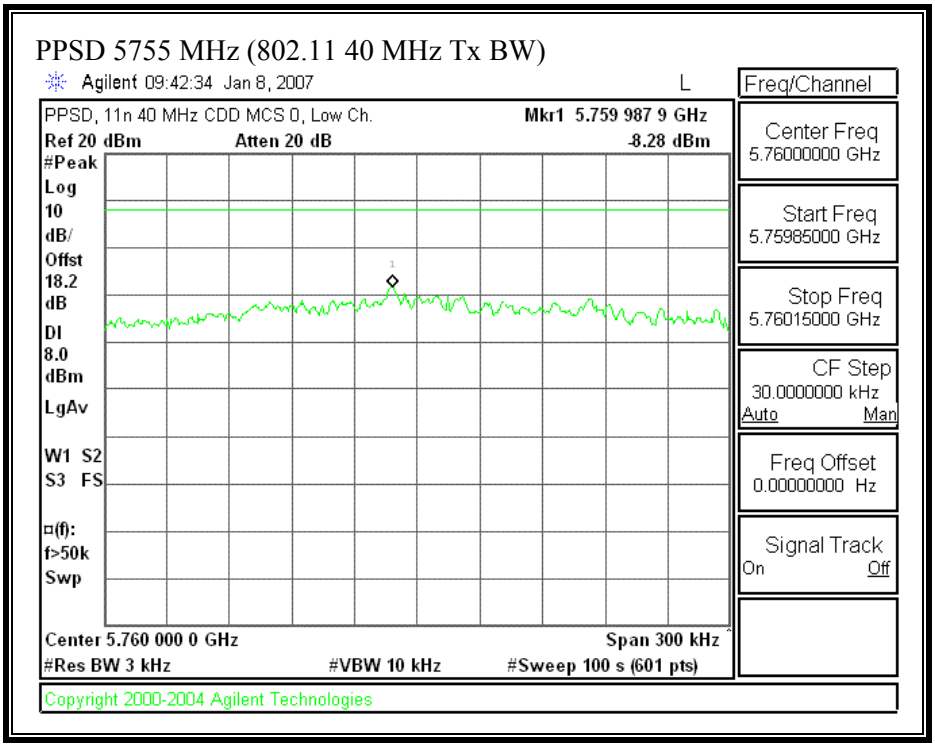
PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



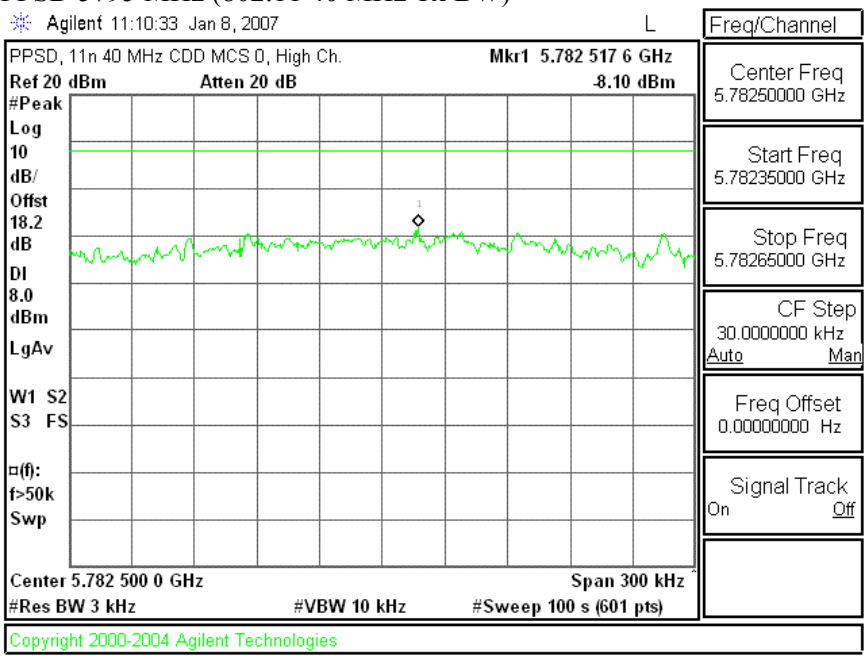
PPSD 5795 MHz (802.11 40 MHz Tx BW Chain 0)



PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



PPSD 5795 MHz (802.11 40 MHz Tx BW)



7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Conducted power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

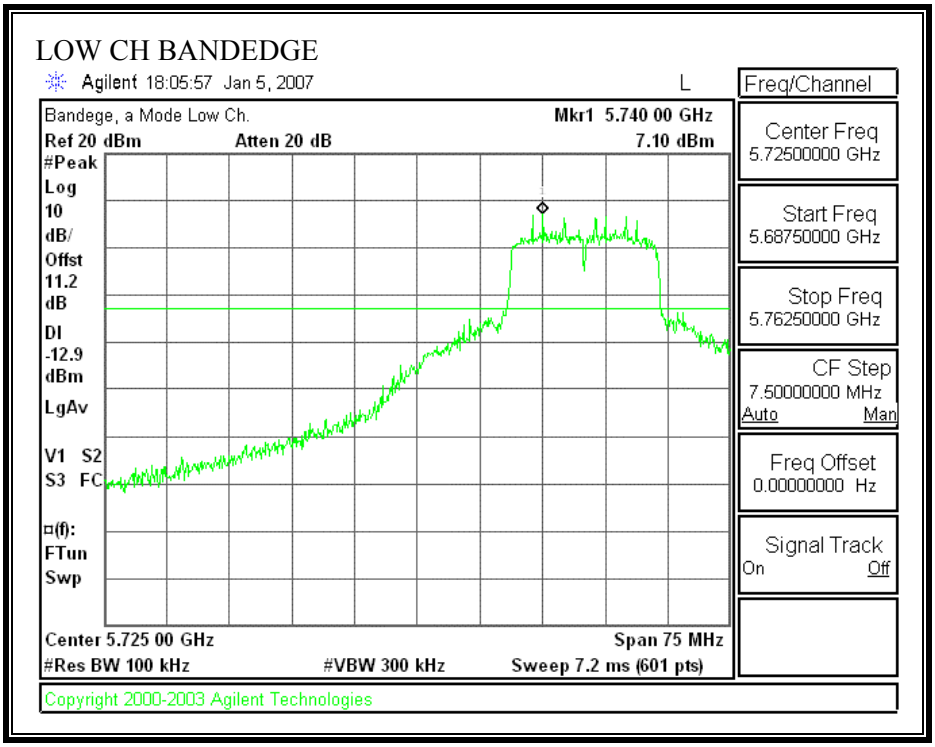
No non-compliance noted:

802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0

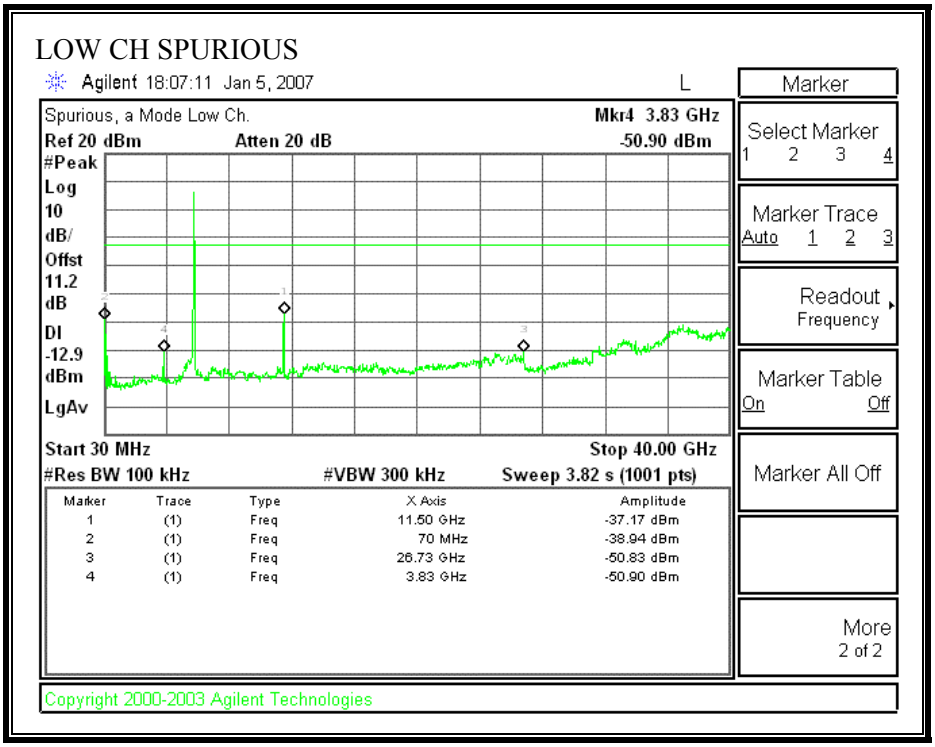
802.11n Mode 20 MHz CDD MCS0

SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

LOW CH BANDEDGE, 5745 MHz

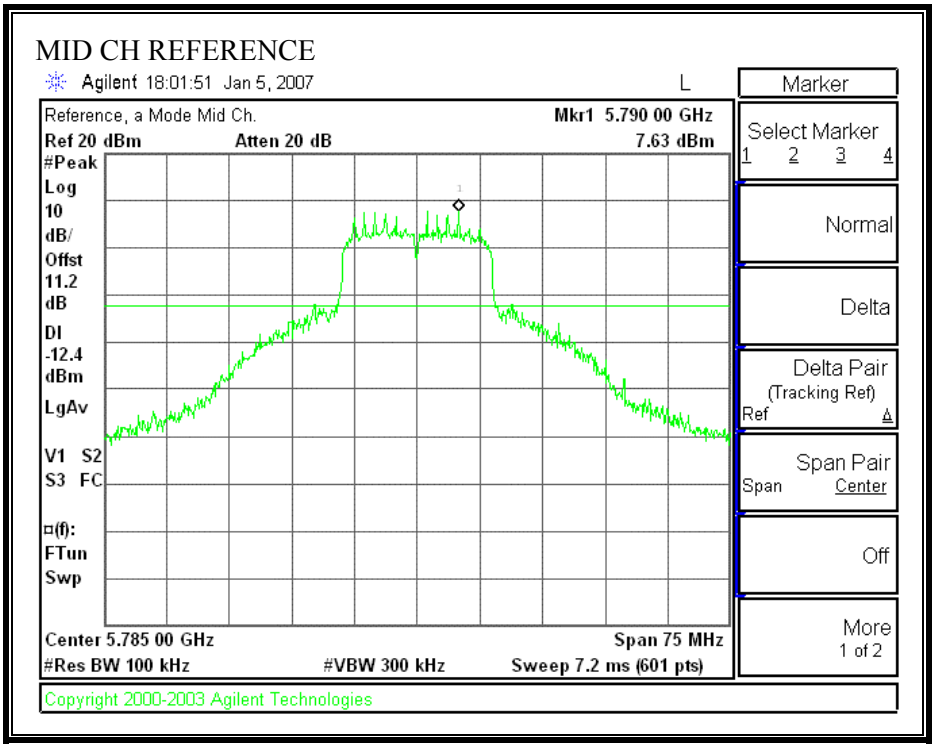


LOW CH SPURIOUS

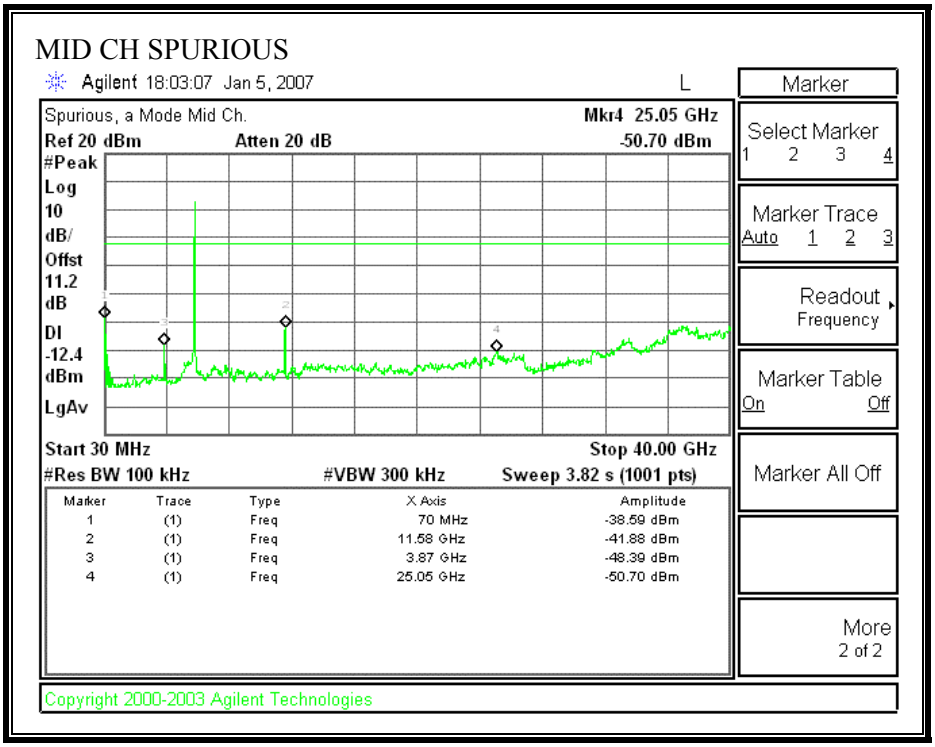


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

MID CH BANDEGE, 5785 MHz

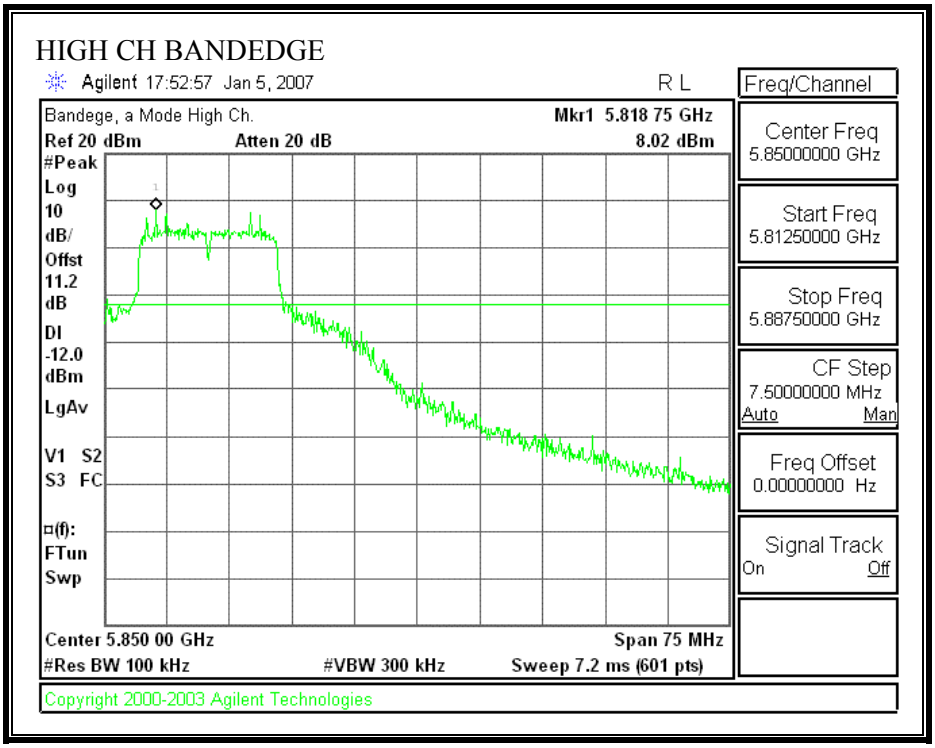


MID CH SPURIOUS

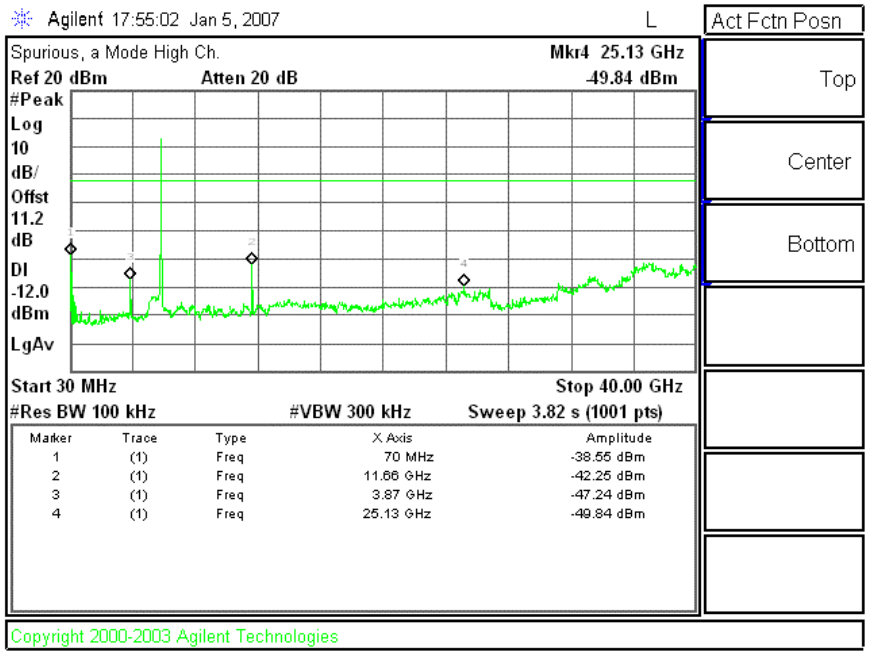


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)

HI CH BANDEDGE, 5825 MHz

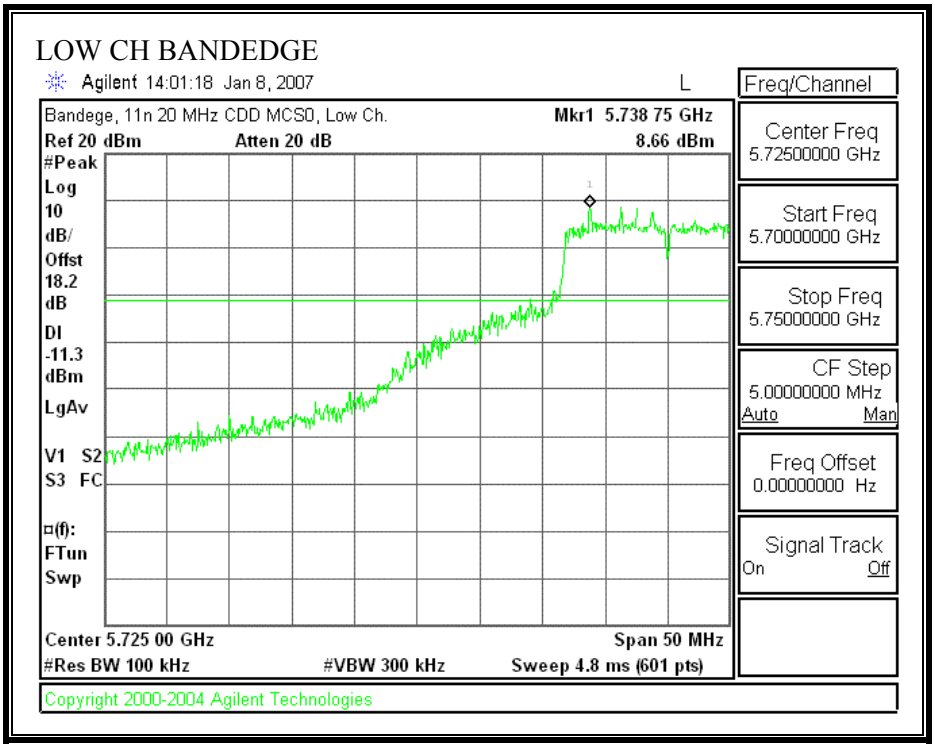


HIGH CH SPURIOUS

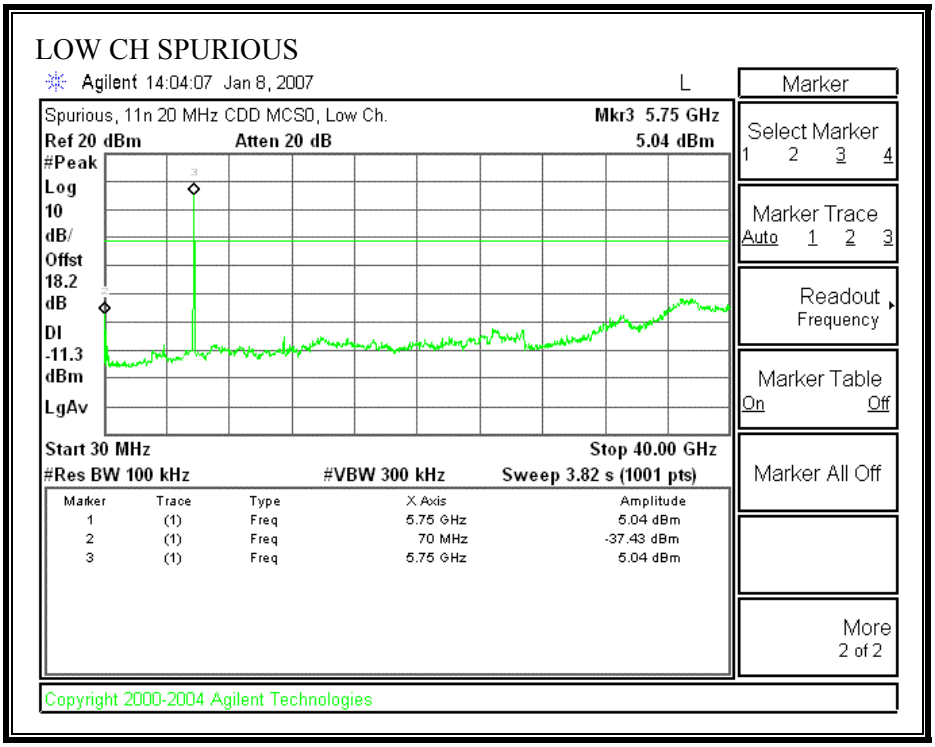


SPURIOUS EMISSIONS, LOW CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

LOW CH BANDEDGE, 5745 MHz

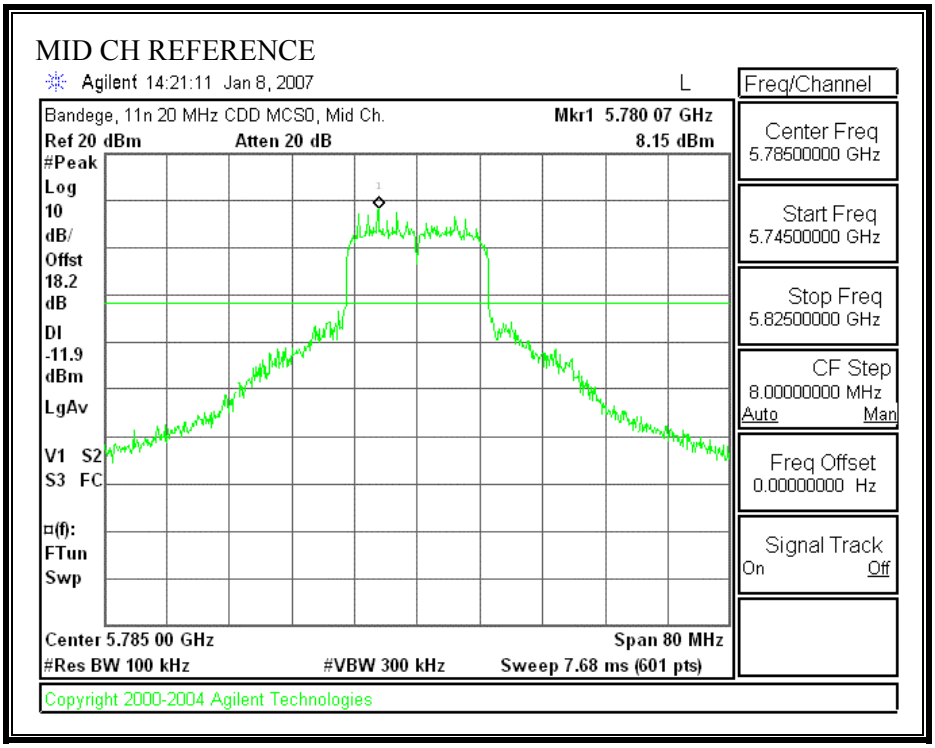


LOW CH SPURIOUS

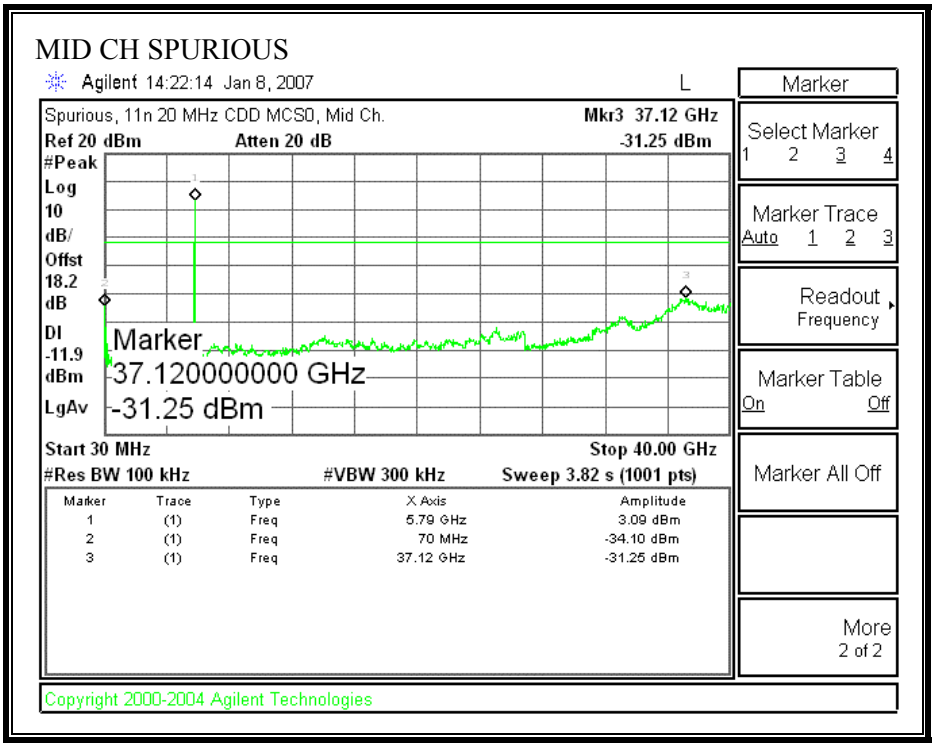


SPURIOUS EMISSIONS, MIDDLE CHANNEL (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)

MID CH BANDEGE, 5785 MHz

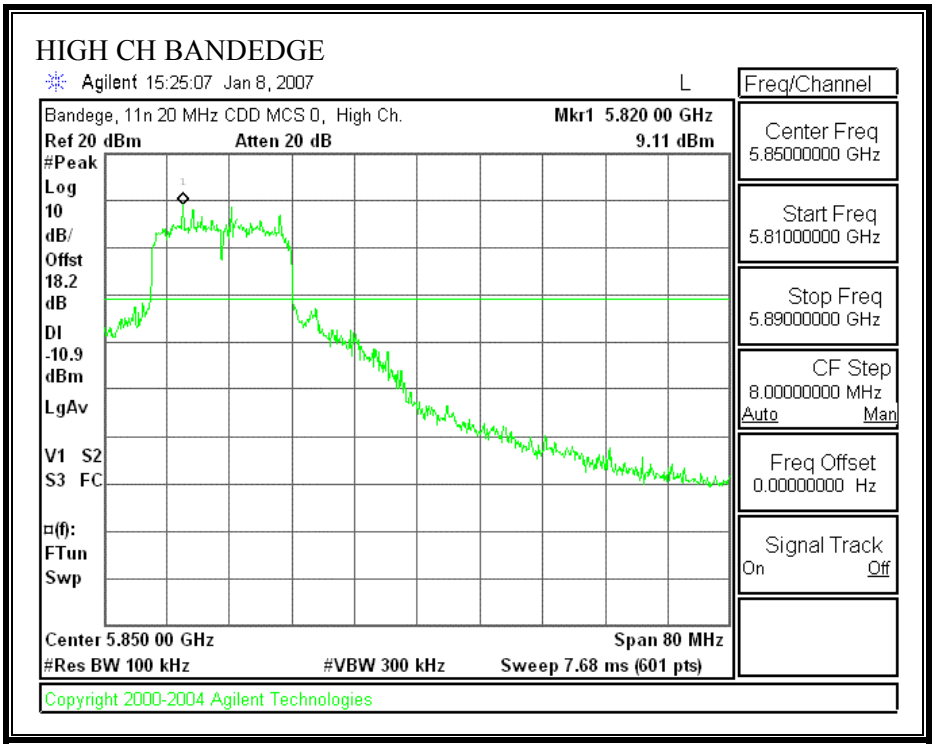


MID CH SPURIOUS

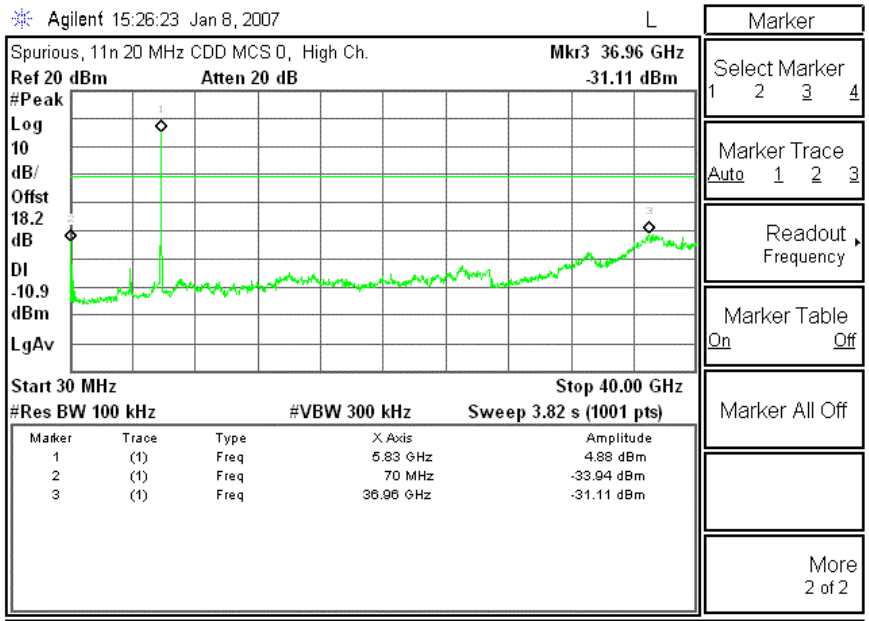


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 40 - MHz TX BANDWIDTH – CHAIN 1)

HI CH BANDEDGE, 5825 MHz



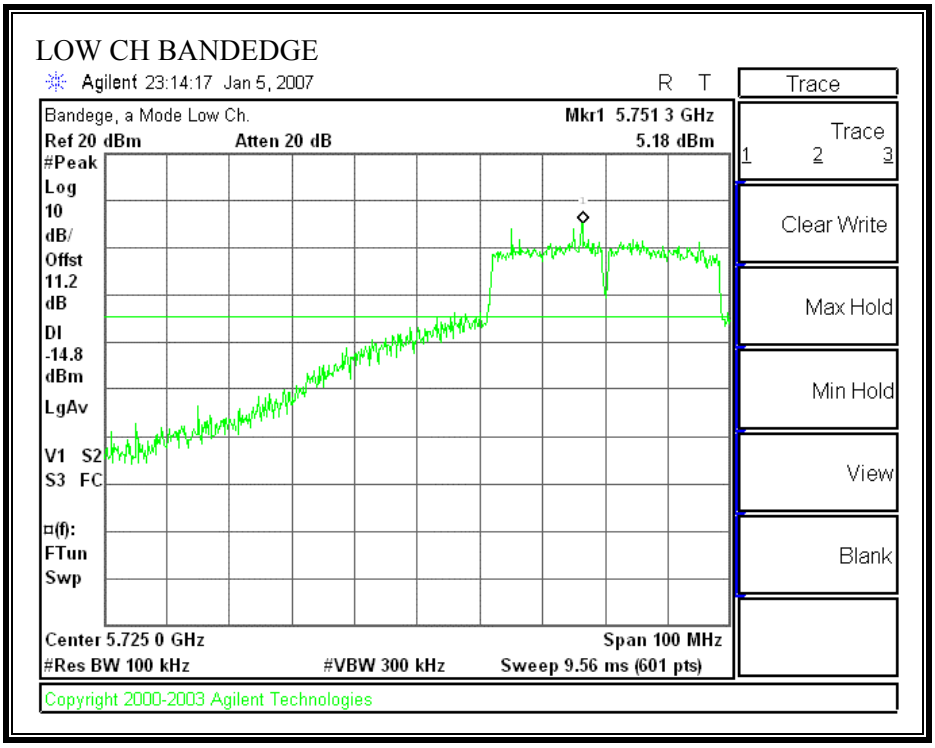
HIGH CH SPURIOUS

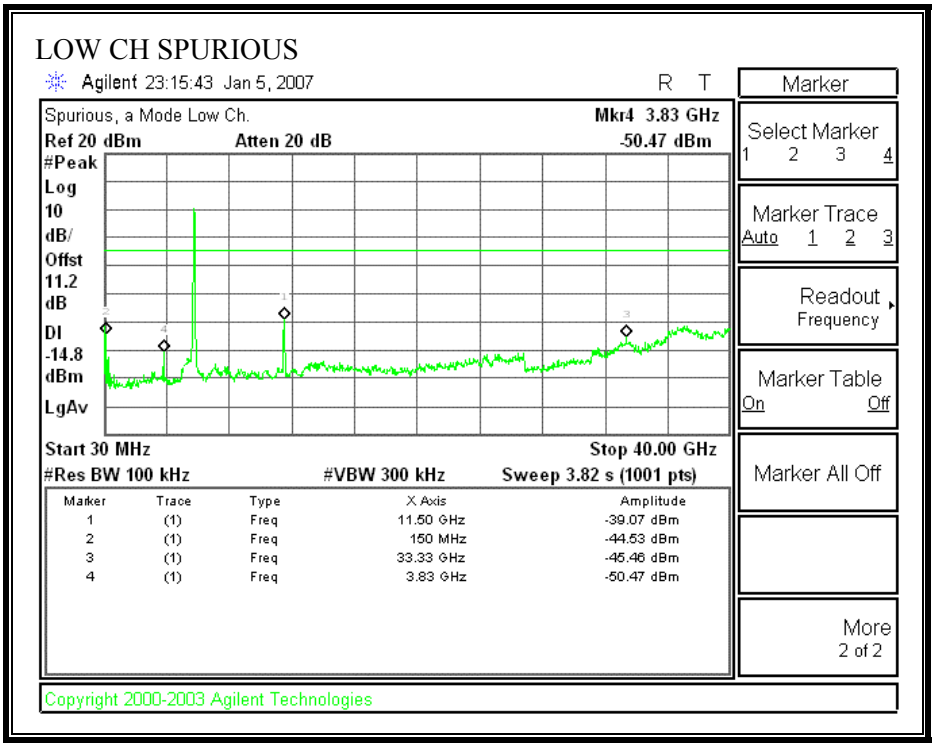


11n 40 MHz CDD MCS32

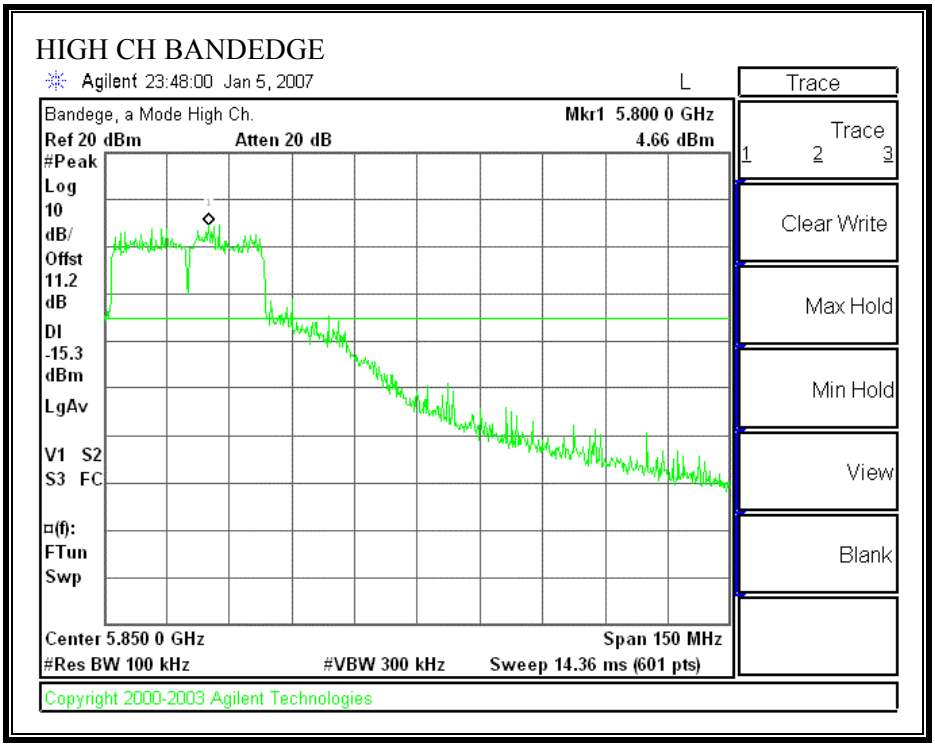
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)

LOW CH BANDEDGE, 5755 MHz

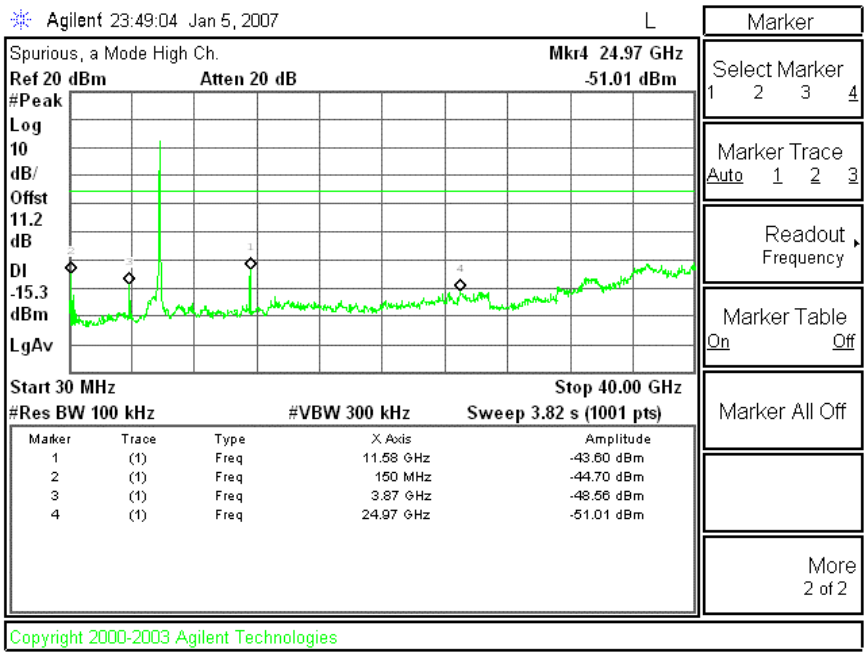




HIGH CH BANDEDGE, 5795 MHz

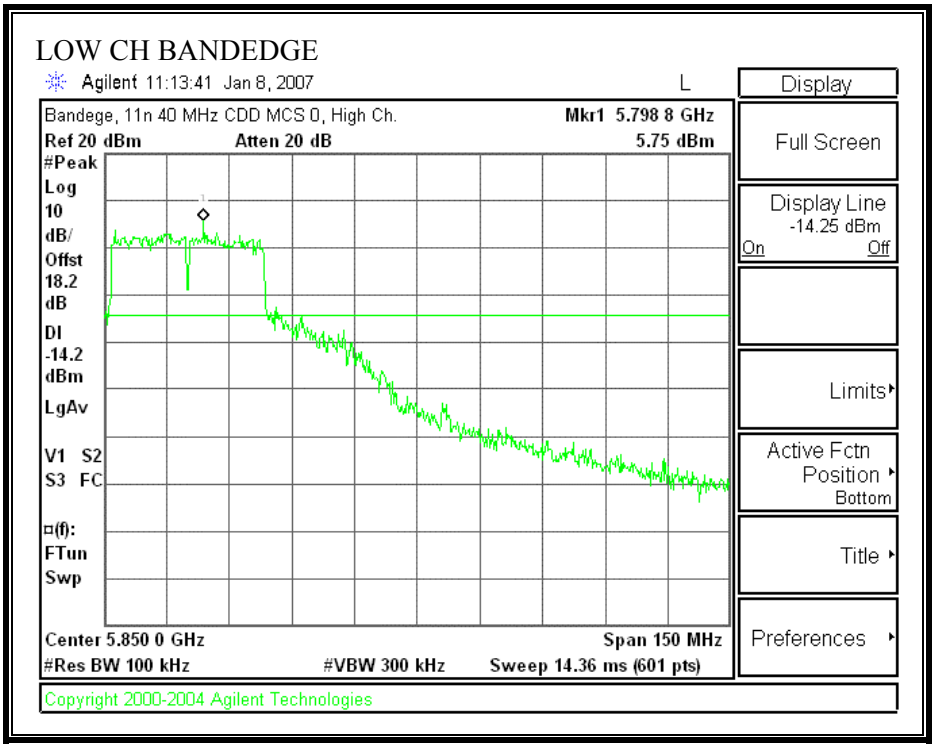


HIGH CH SPURIOUS

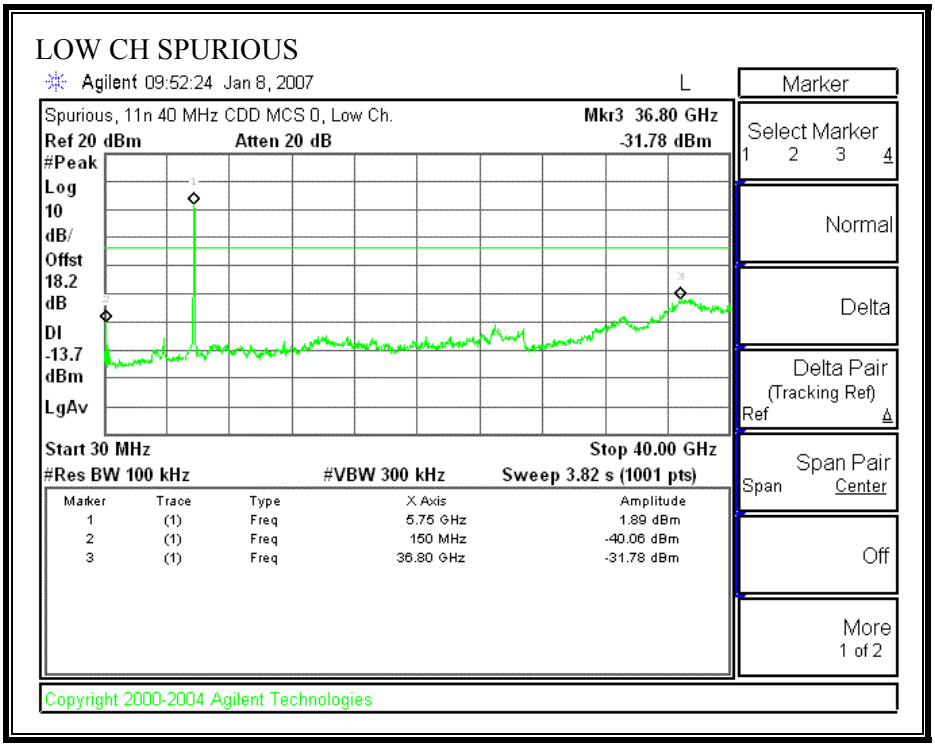


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)

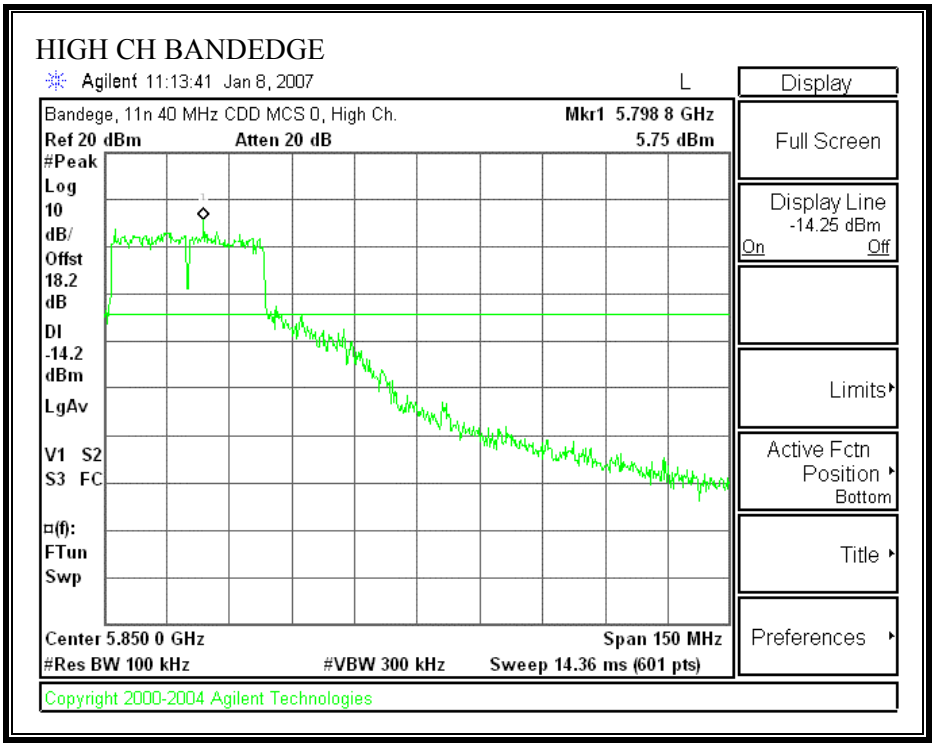
LOW CH BANDEDGE, 5755 MHz



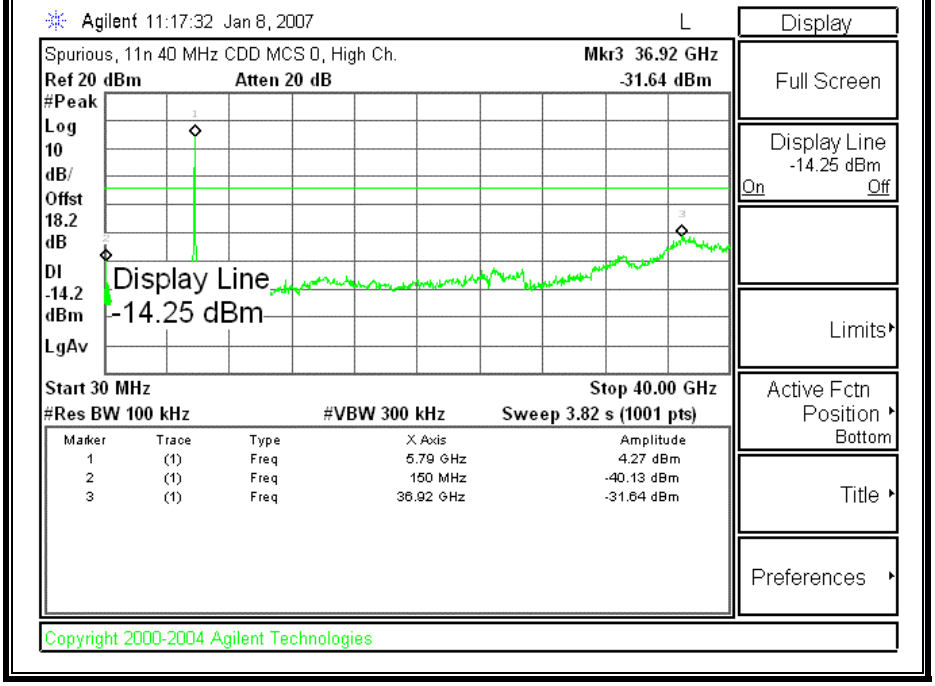
LOW CH SPURIOUS



HI CH BANDEDGE, 5795 MHz



HIGH CH SPURIOUS



7.5. RADIATED EMISSIONS

7.5.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

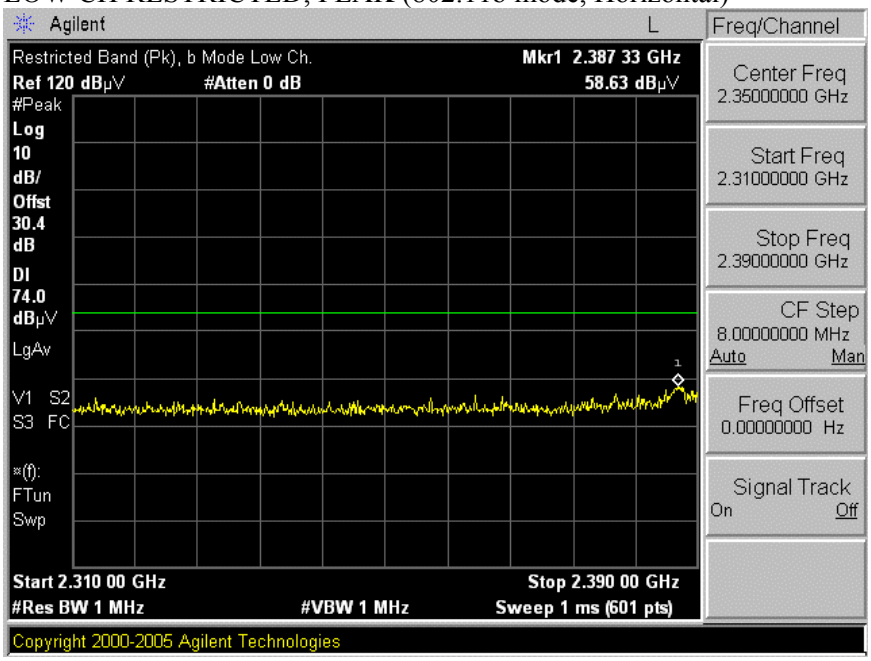
LEGACY MODE

7.5.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

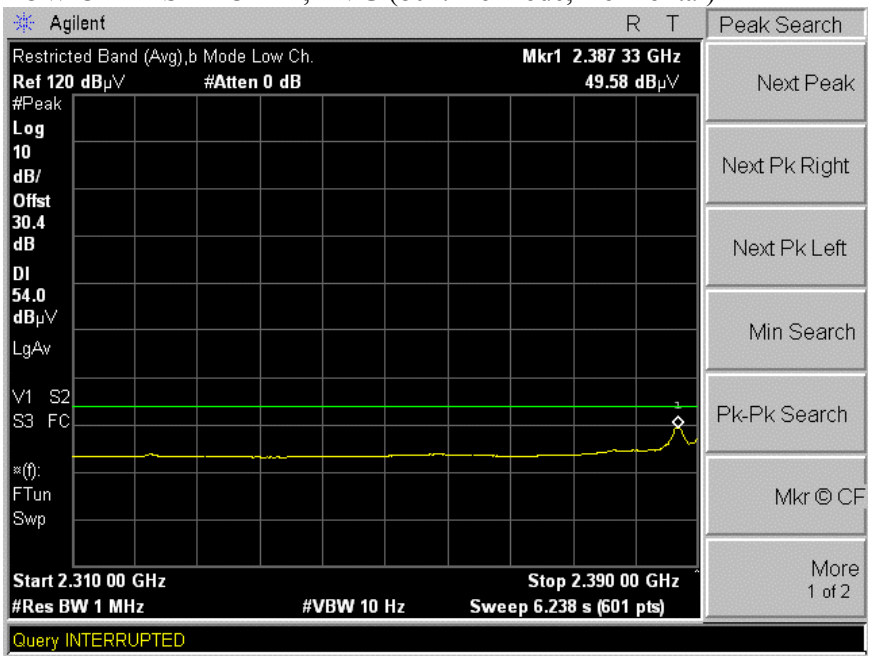
11b Legacy Mode

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2412 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)

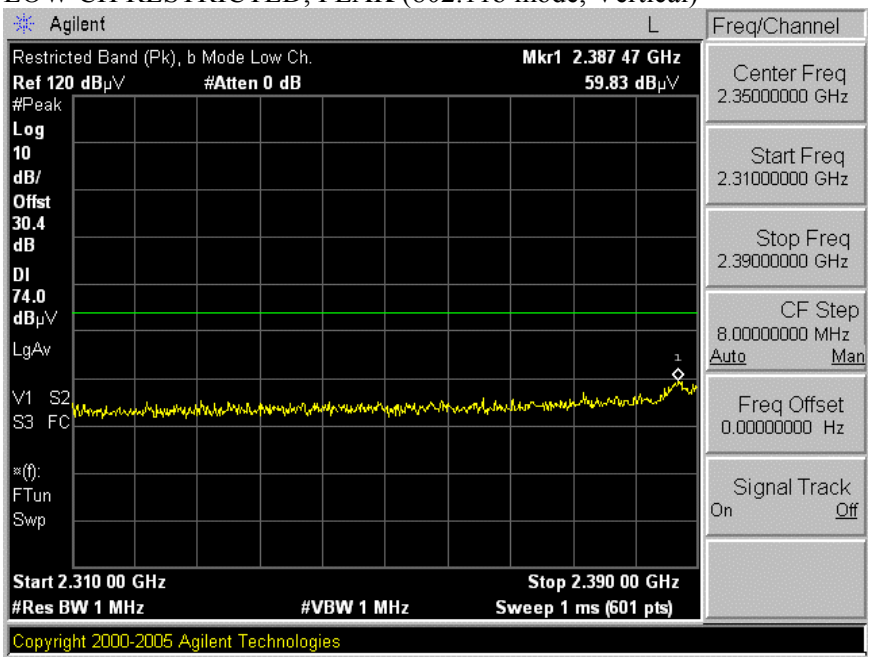


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

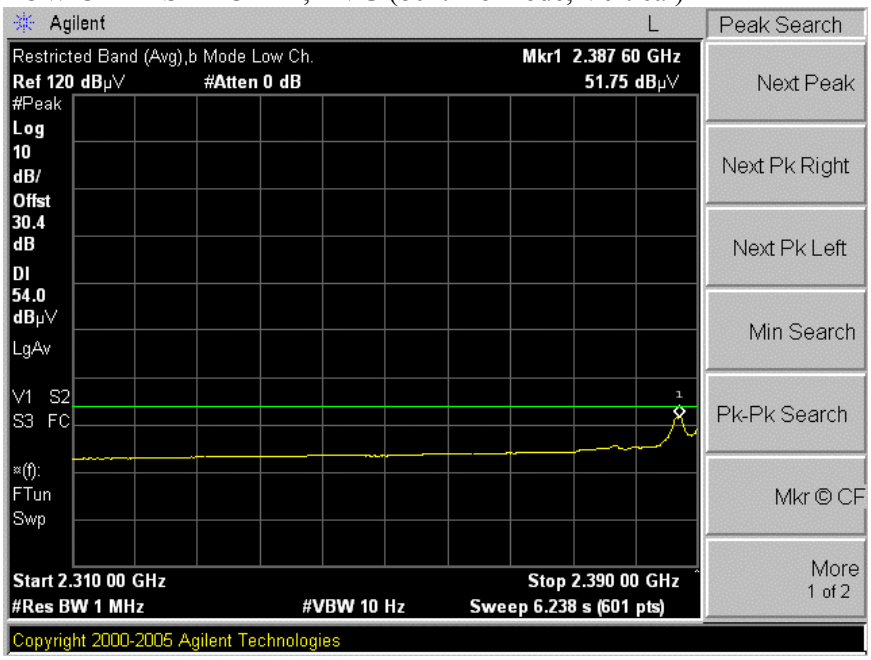


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2412 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)

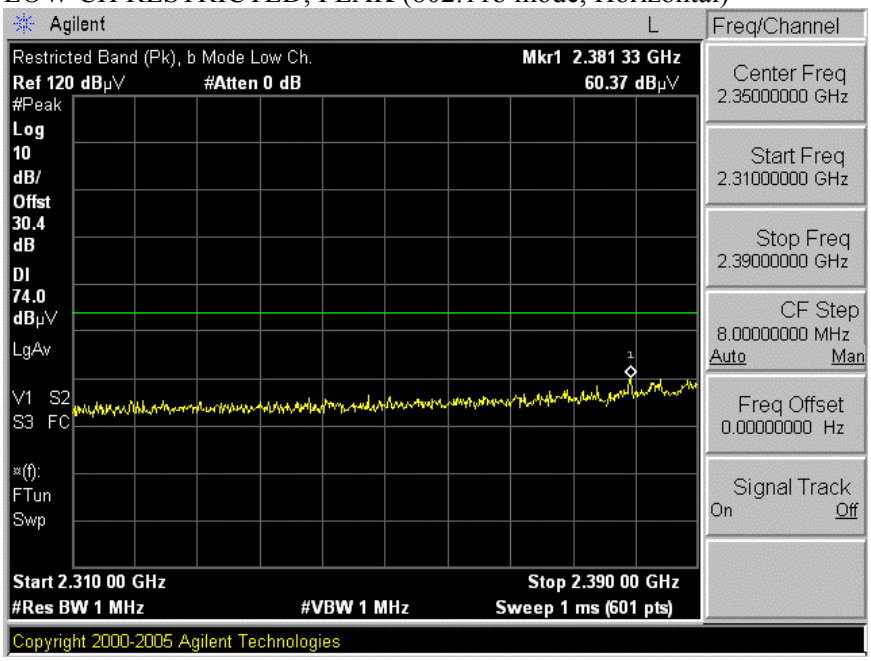


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

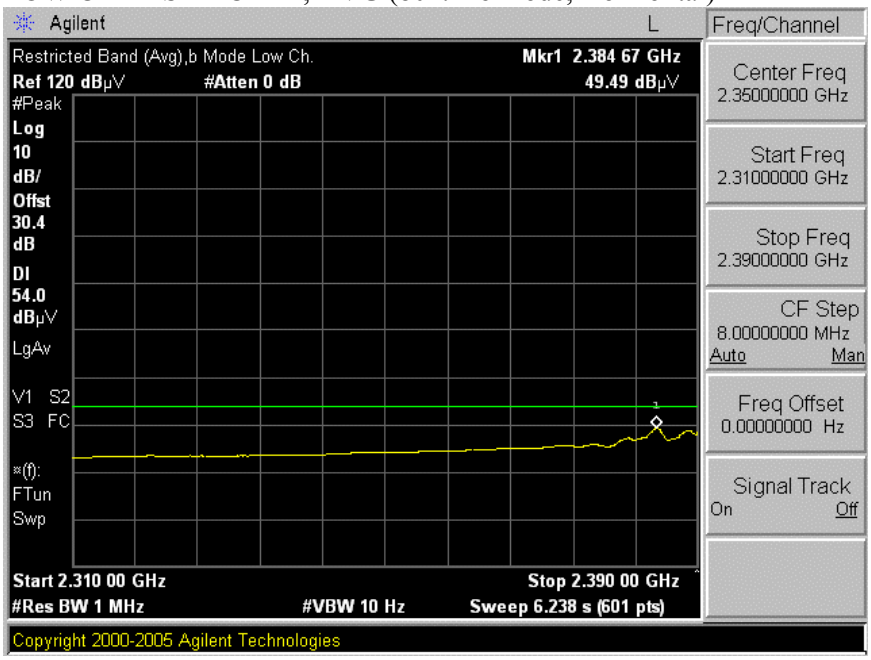


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2417 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)

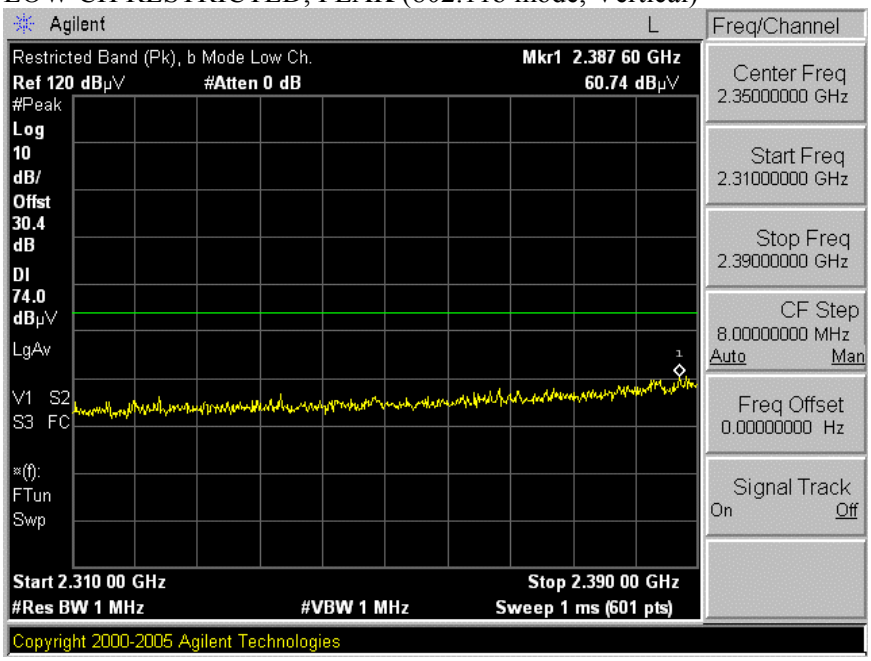


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

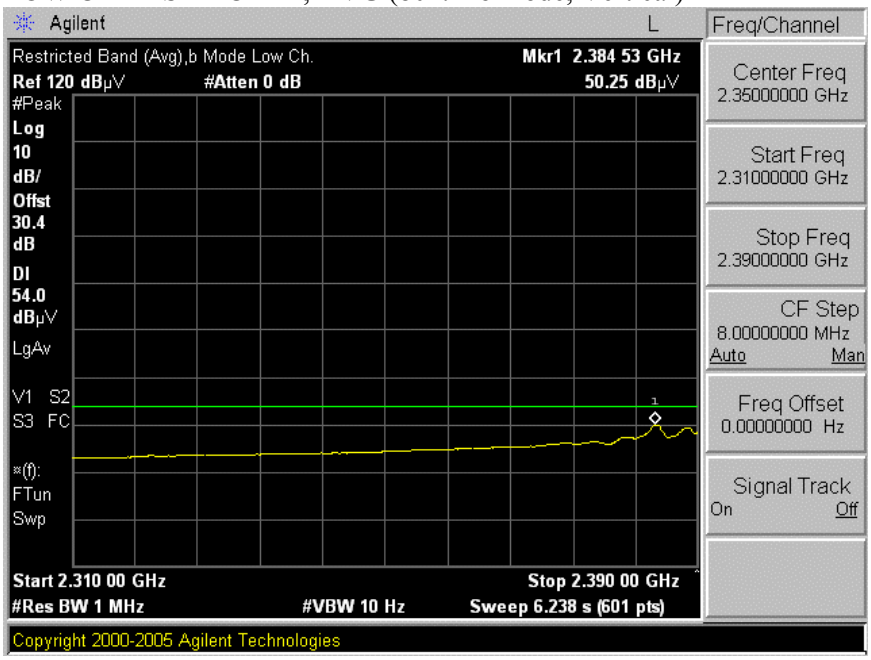


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2417 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)

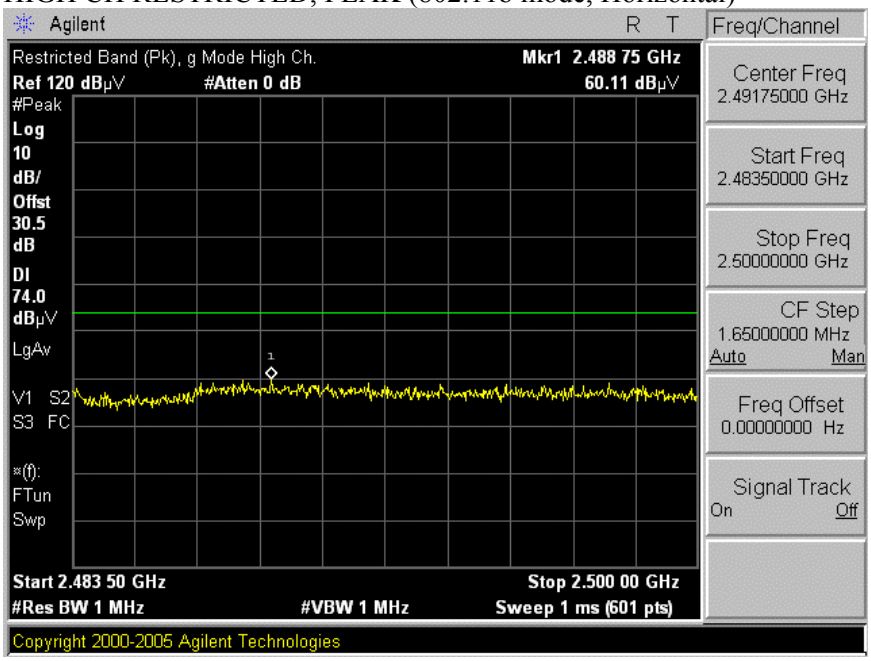


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

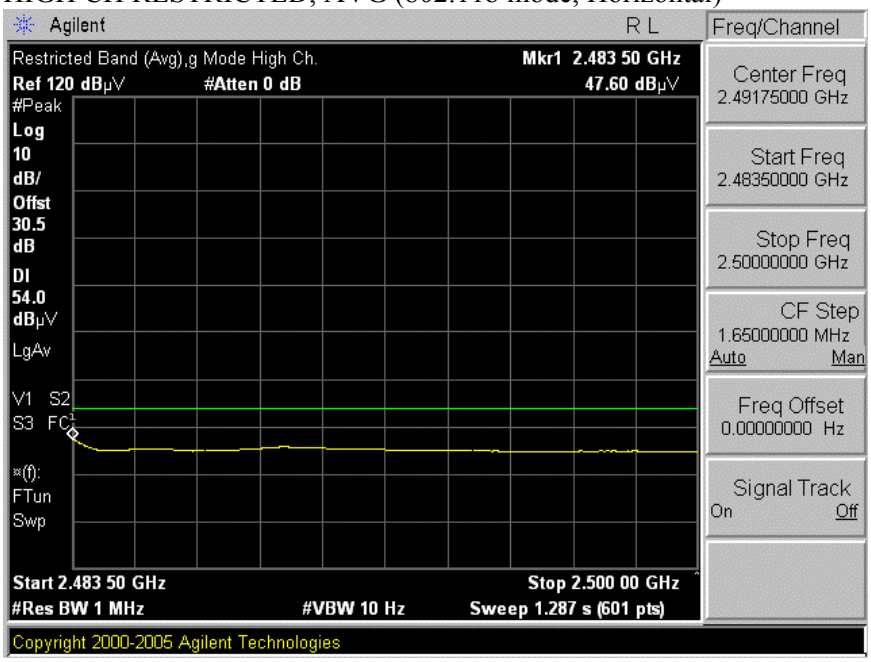


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2457 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Horizontal)

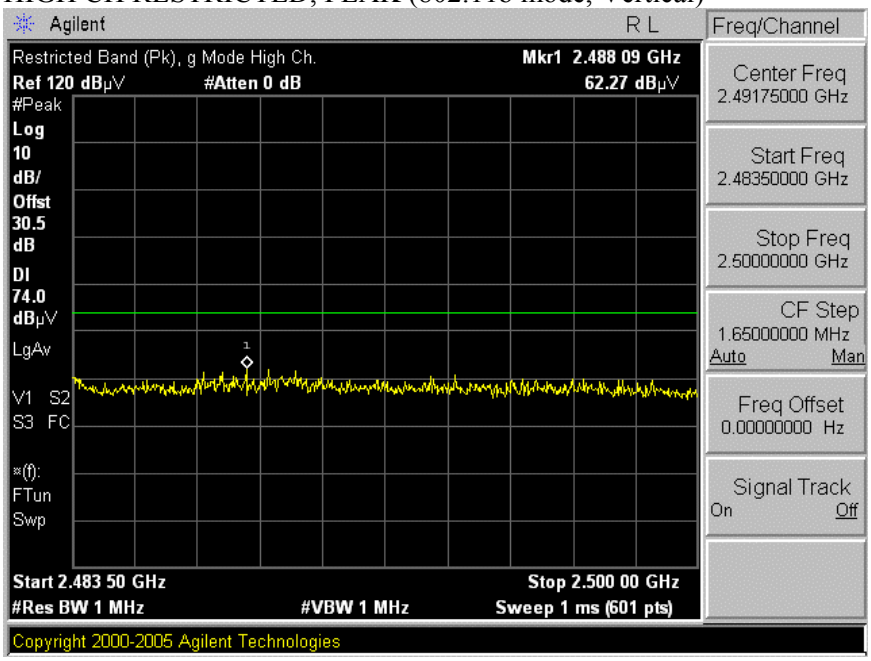


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

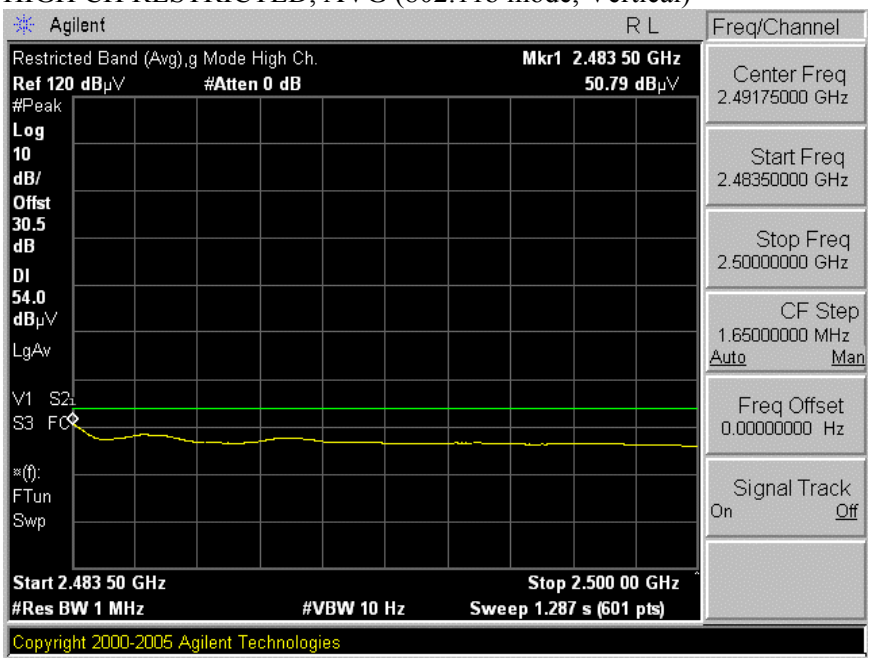


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2457 MHz, VERTICAL)

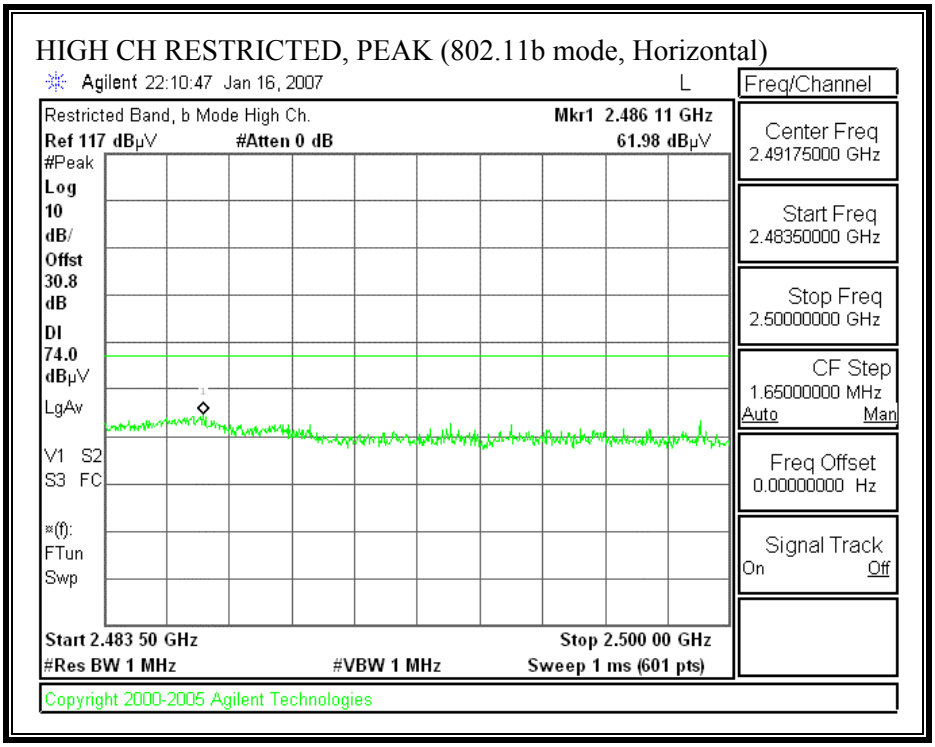
HIGH CH RESTRICTED, PEAK (802.11b mode, Vertical)



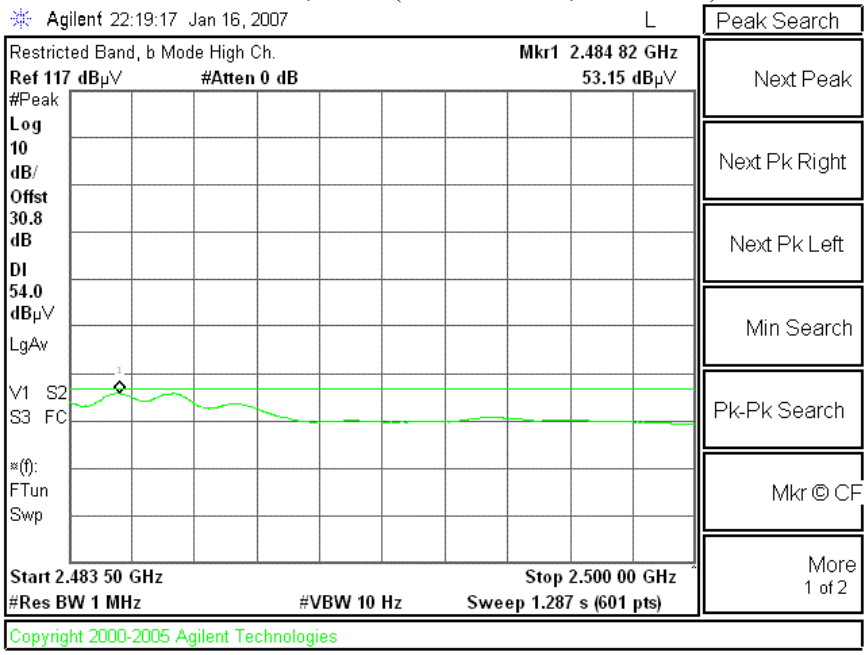
HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



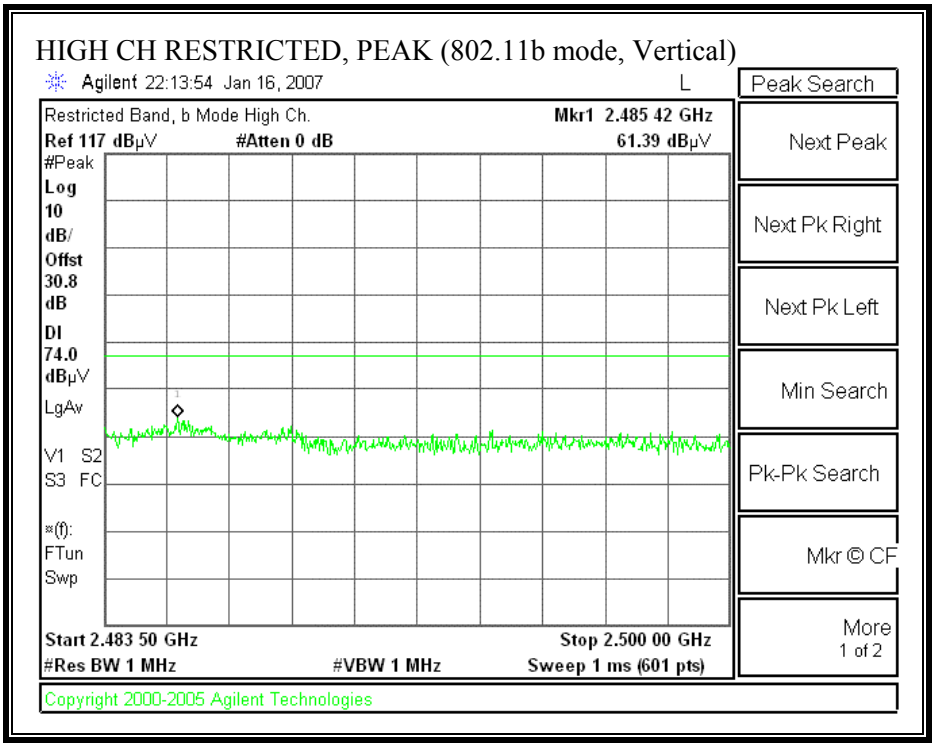
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2462 MHz, HORIZONTAL)



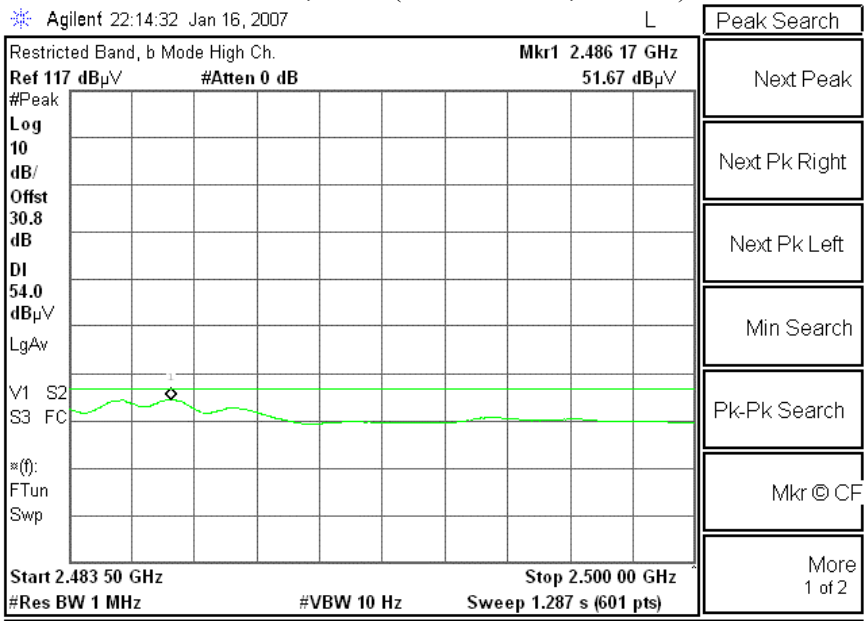
HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)



RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2462 MHz, VERTICAL)



HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (b MODE)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: BroadCom Corporation
Project #: 06U10708
Test Engineer: Thanh Nguyen
Configuration: EUT & Hitachi Antenna
Mode Of Operation: Tx 11b Legacy Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

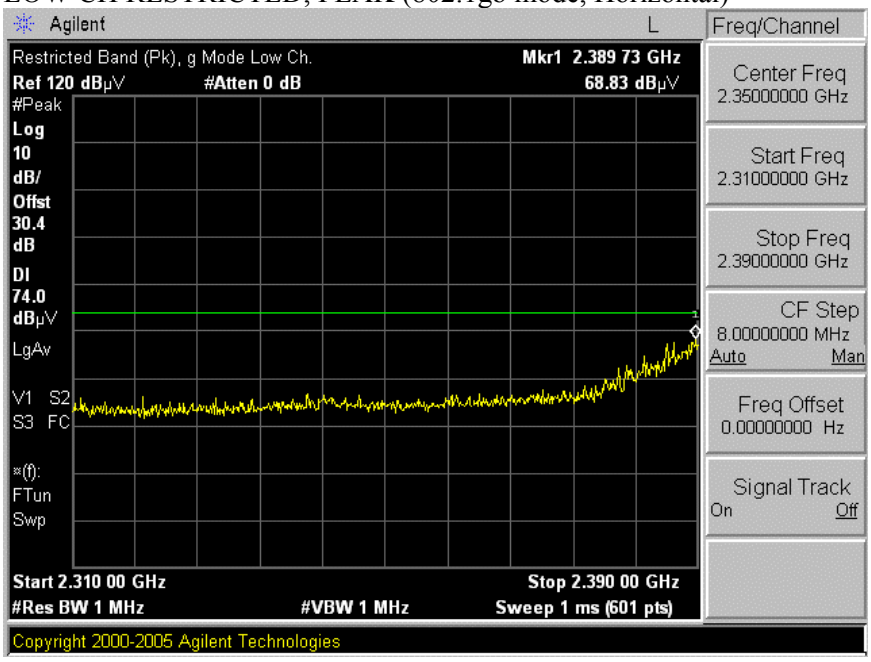
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel															
4.824	3.0	51.57	50.00	33.7	2.8	-34.8	0.0	0.6	53.8	52.3	74	54	-20.2	-1.7	V
4.824	3.0	52.84	50.78	33.7	2.8	-34.8	0.0	0.6	55.1	53.0	74	54	-18.9	-1.0	H
Mid Channel															
4.874	3.0	50.90	47.91	33.8	2.8	-34.8	0.0	0.6	53.3	50.3	74	54	-20.7	-3.7	V
7.311	3.0	42.41	42.37	35.5	3.3	-34.1	0.0	0.6	47.8	47.7	74	54	-26.2	-6.3	V
12.185	3.0	41.46	30.12	38.5	4.3	-32.5	0.0	0.9	52.7	41.4	74	54	-21.3	-12.6	V
4.874	3.0	52.55	50.61	33.8	2.8	-34.8	0.0	0.6	54.9	53.0	74	54	-19.1	-1.0	H
7.311	3.0	43.87	32.73	35.5	3.3	-34.1	0.0	0.6	49.2	38.1	74	54	-24.8	-15.9	H
12.185	3.0	43.10	30.34	38.5	4.3	-32.5	0.0	0.9	54.4	41.6	74	54	-19.6	-12.4	H
High Channel															
4.924	3.0	54.49	50.64	33.8	2.8	-34.8	0.0	0.6	56.9	53.1	74	54	-17.1	-0.9	V
7.386	3.0	44.49	34.63	35.6	3.3	-34.1	0.0	0.6	50.0	40.1	74	54	-24.0	-13.9	V
12.310	3.0	42.01	30.25	38.5	4.4	-32.5	0.0	0.9	53.3	41.6	74	54	-20.7	-12.4	V
4.924	3.0	52.50	50.81	33.8	2.8	-34.8	0.0	0.6	55.0	53.3	74	54	-19.0	-0.7	H
7.386	3.0	45.33	36.50	35.6	3.3	-34.1	0.0	0.6	50.8	42.0	74	54	-23.2	-12.0	H
12.310	3.0	45.24	36.27	38.5	4.4	-32.5	0.0	0.9	56.6	47.6	74	54	-17.4	-6.4	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

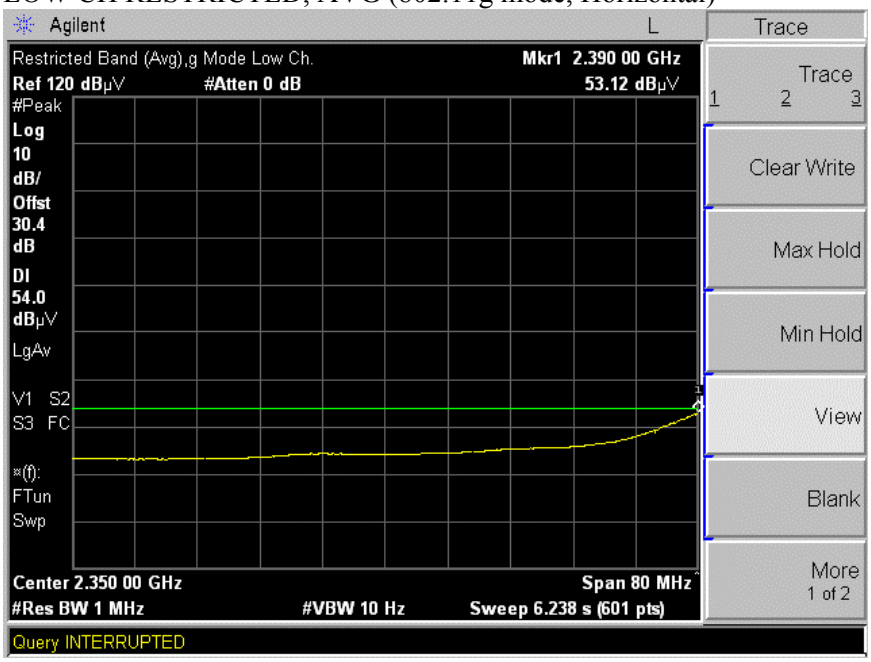
11g Legacy Mode

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2412 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.1gb mode, Horizontal)

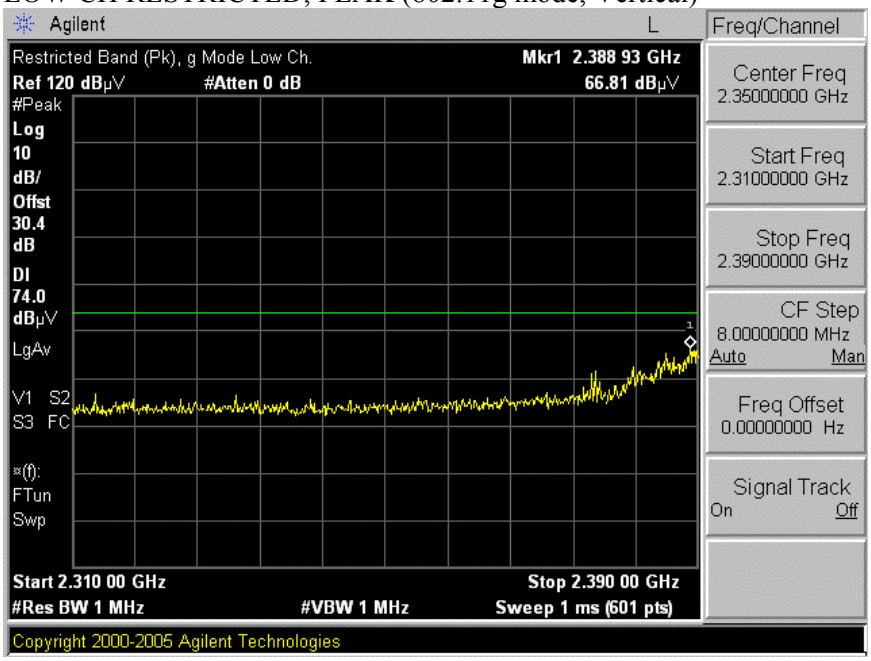


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

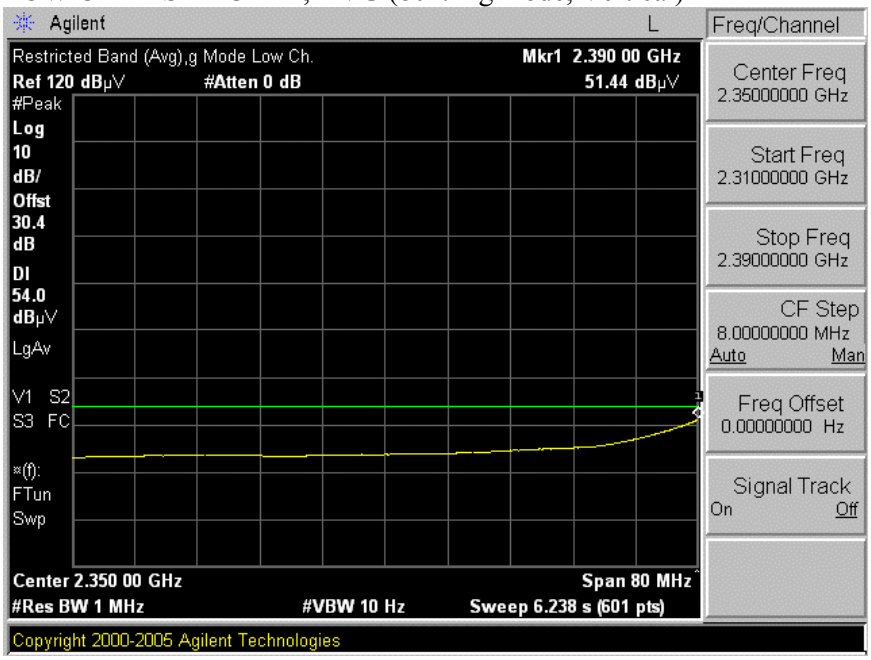


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2412 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)

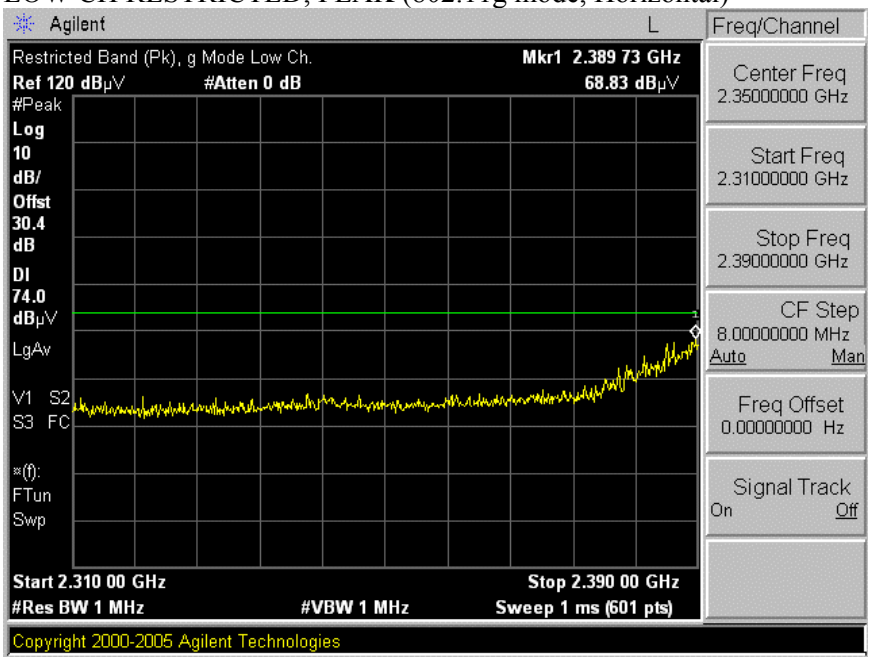


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

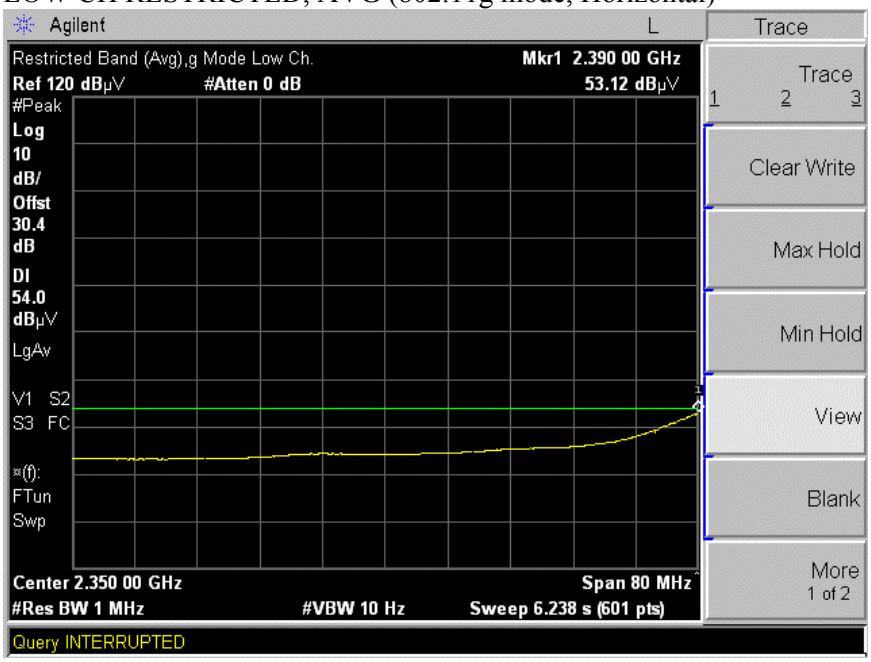


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2417 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Horizontal)

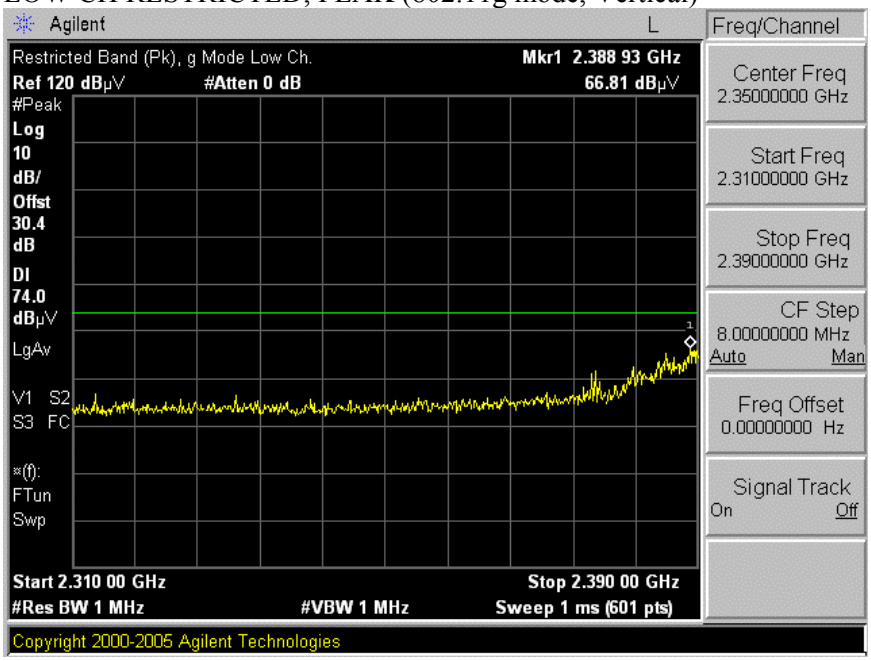


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

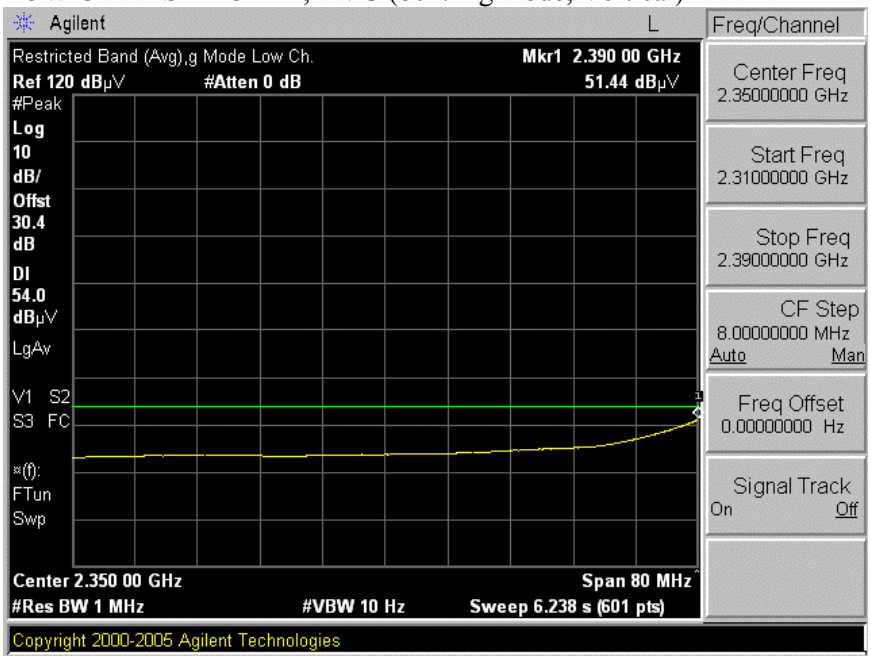


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2417 MHz, VERTICAL)

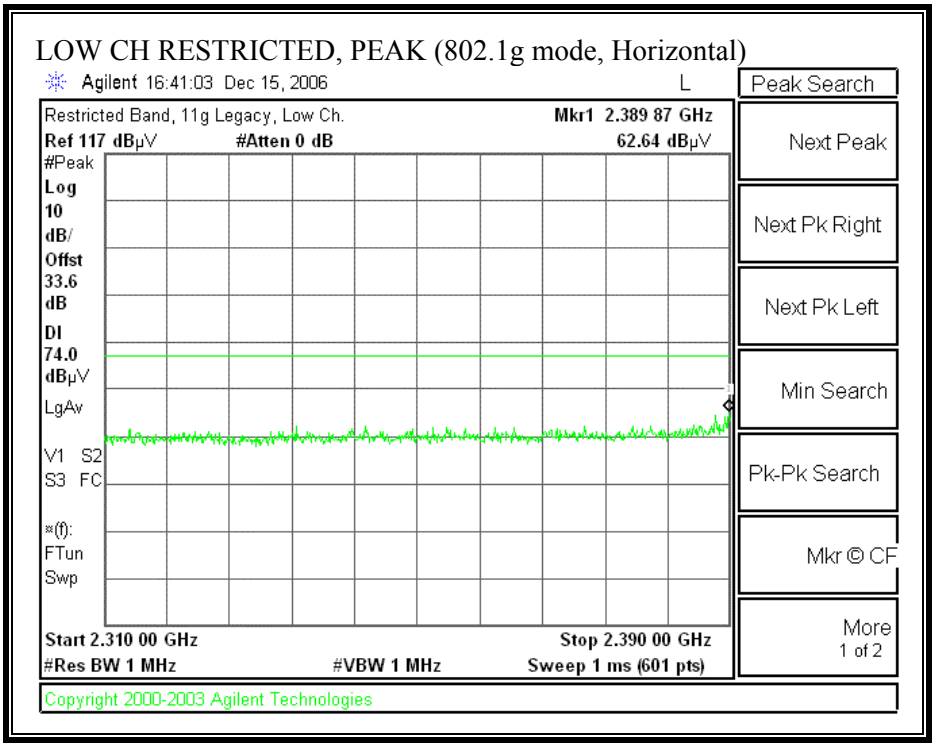
LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)



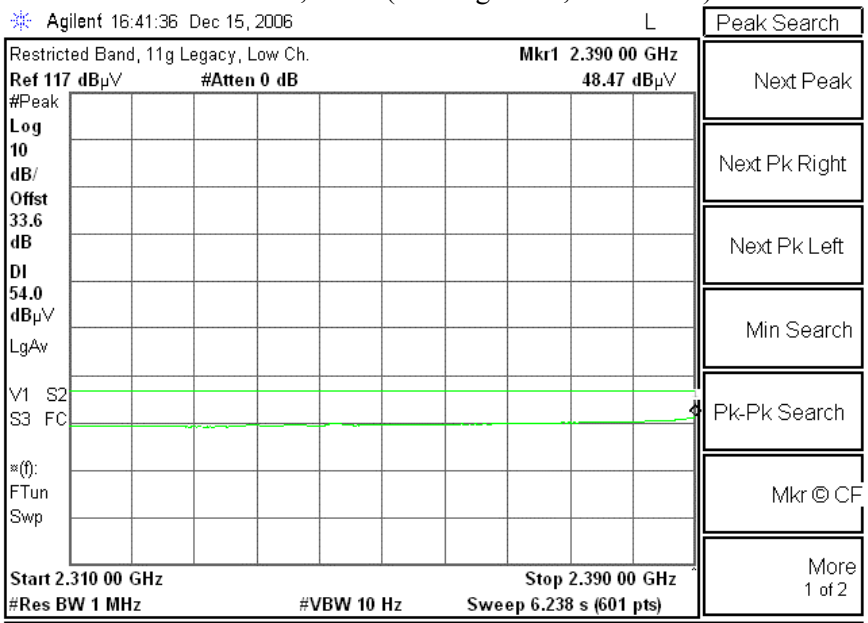
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



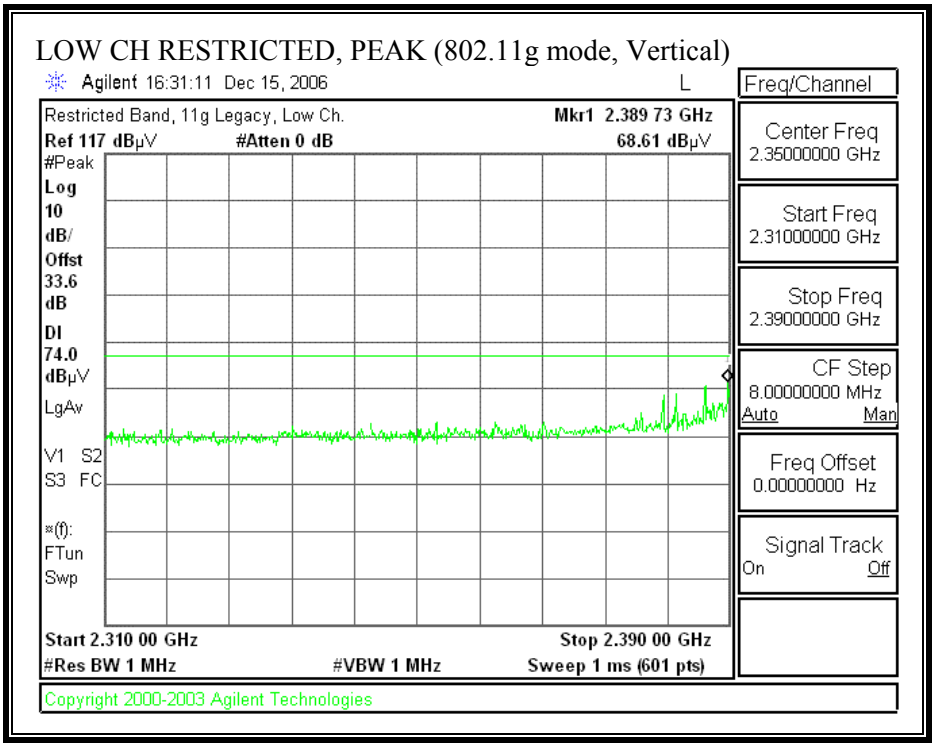
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2422 MHz, HORIZONTAL)



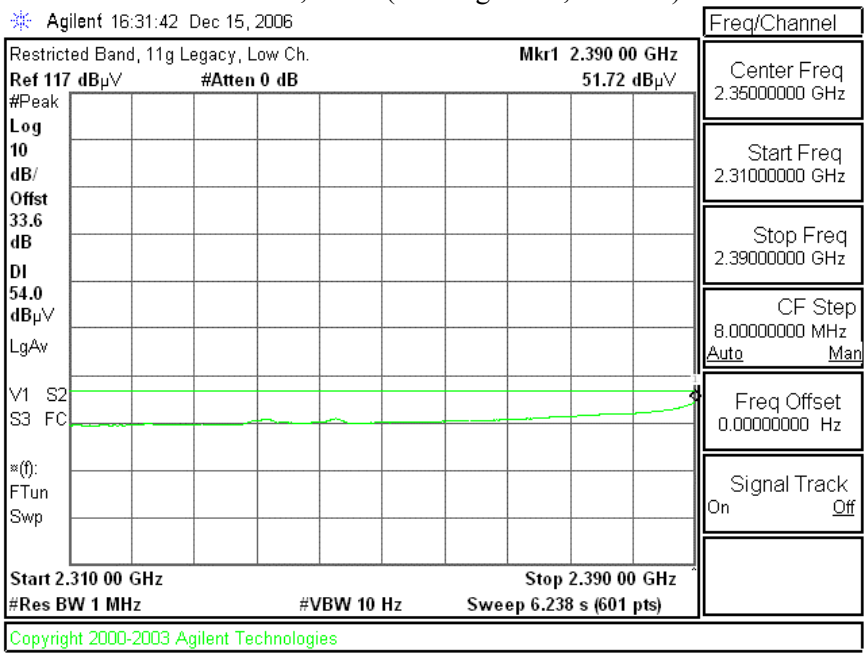
LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)



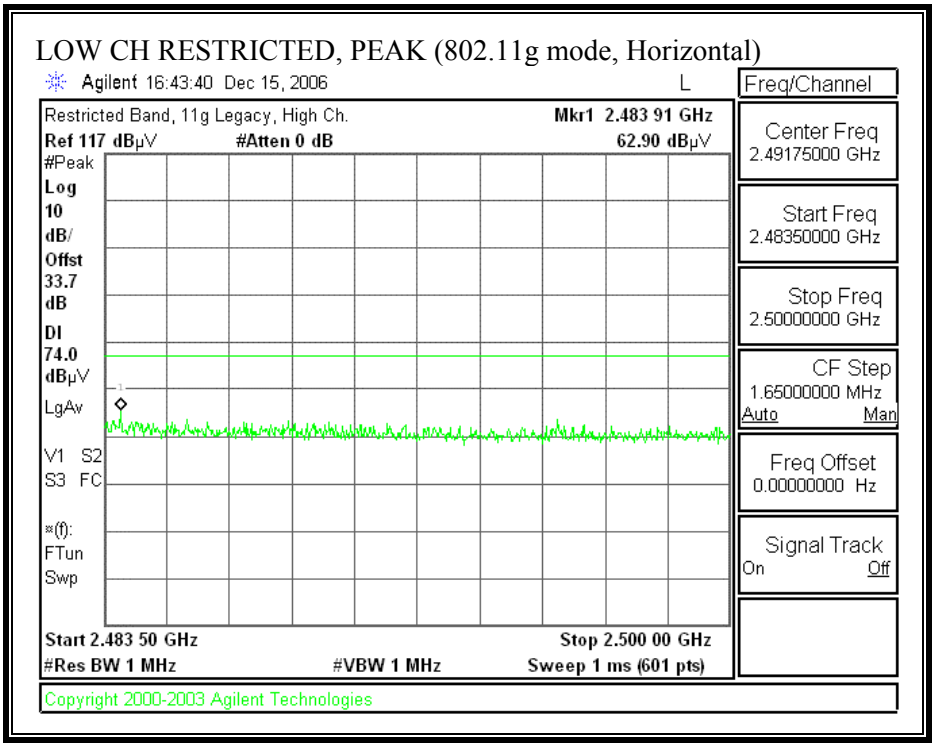
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2422 MHz, VERTICAL)



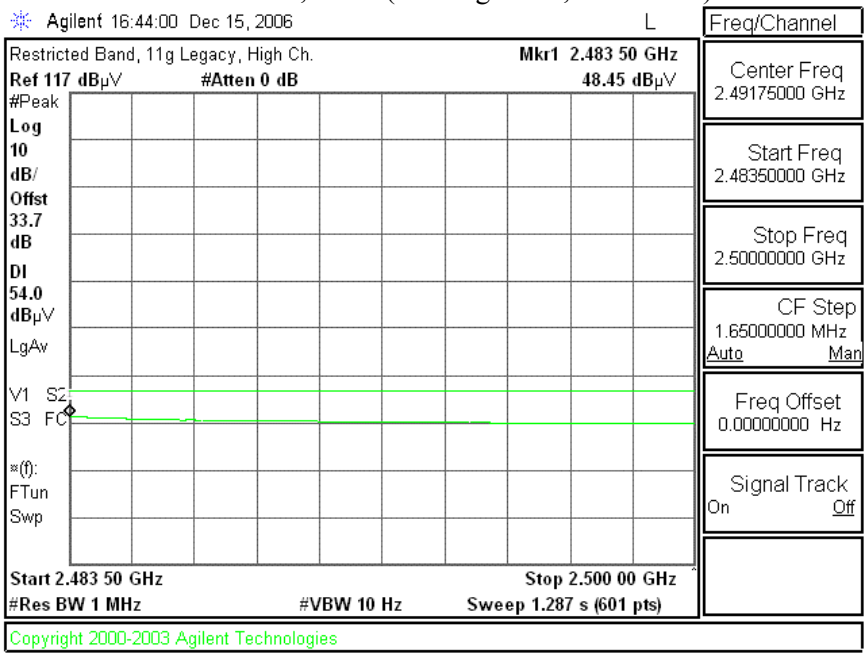
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



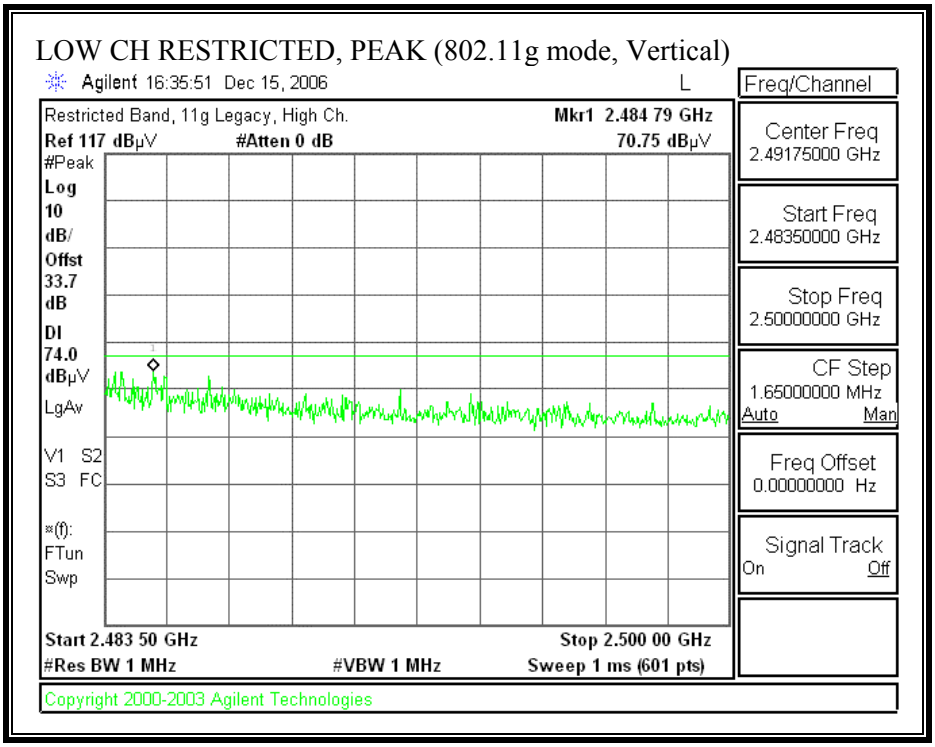
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2452 MHz, HORIZONTAL)



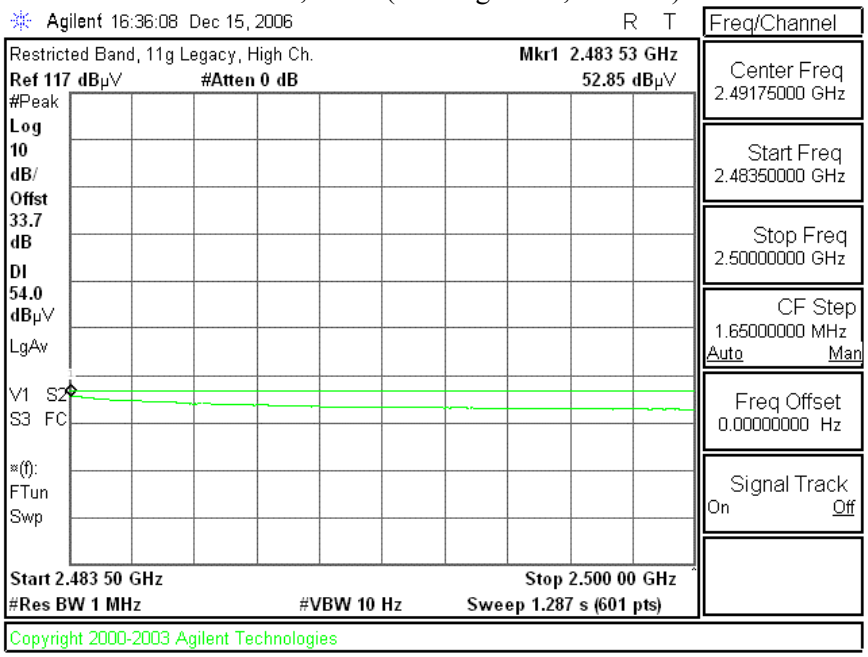
LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)



RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2452 MHz, VERTICAL)

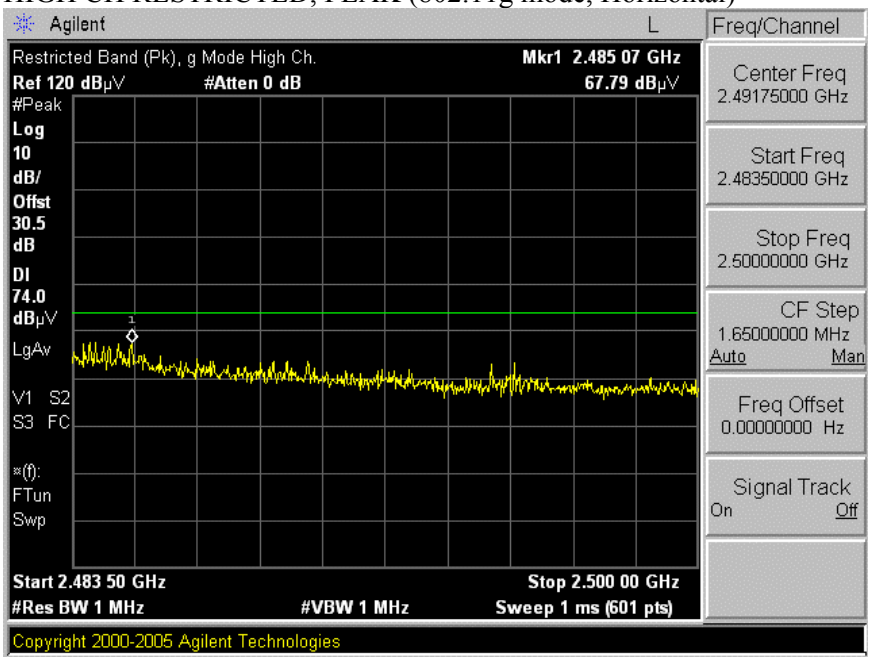


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

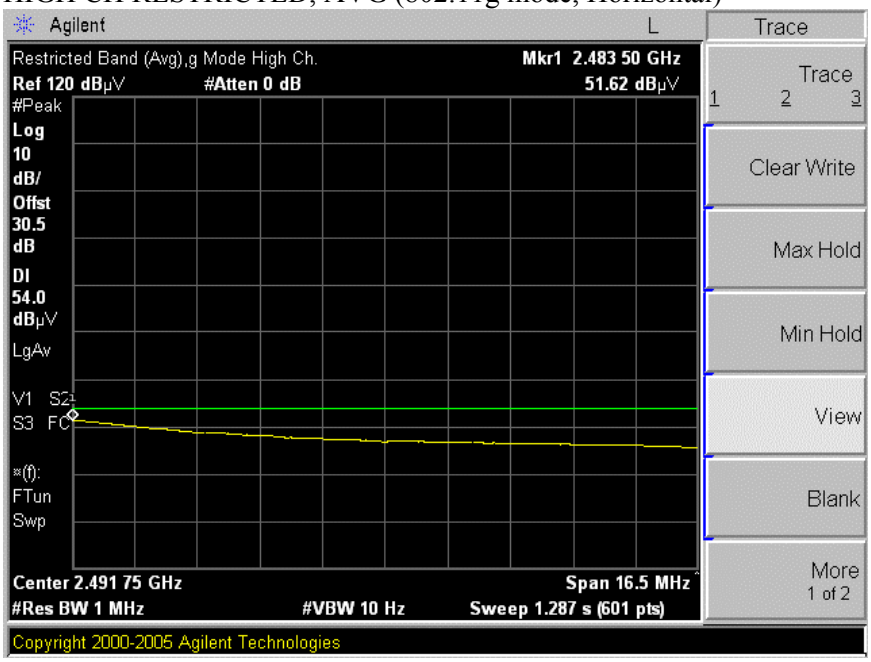


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2457 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Horizontal)

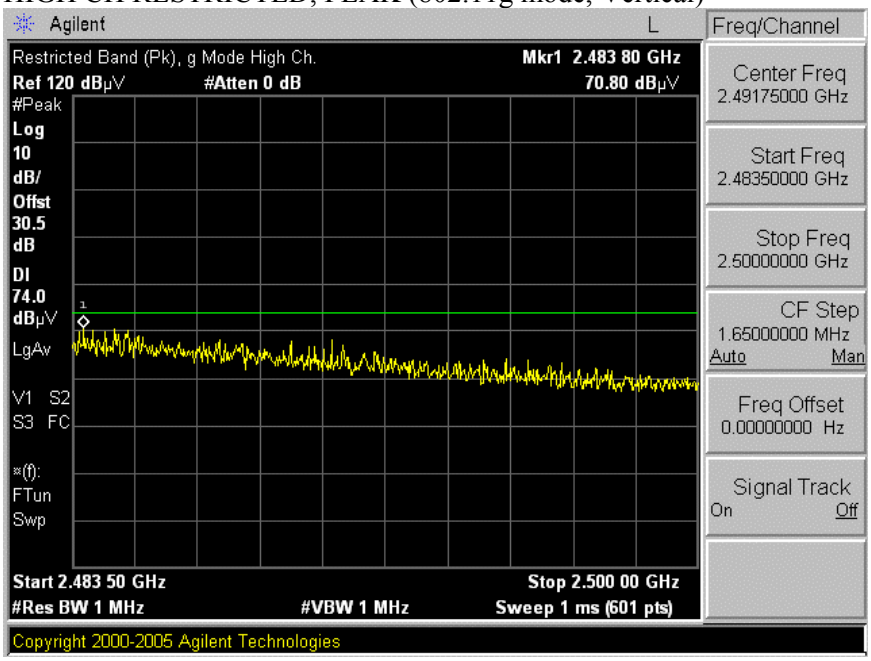


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

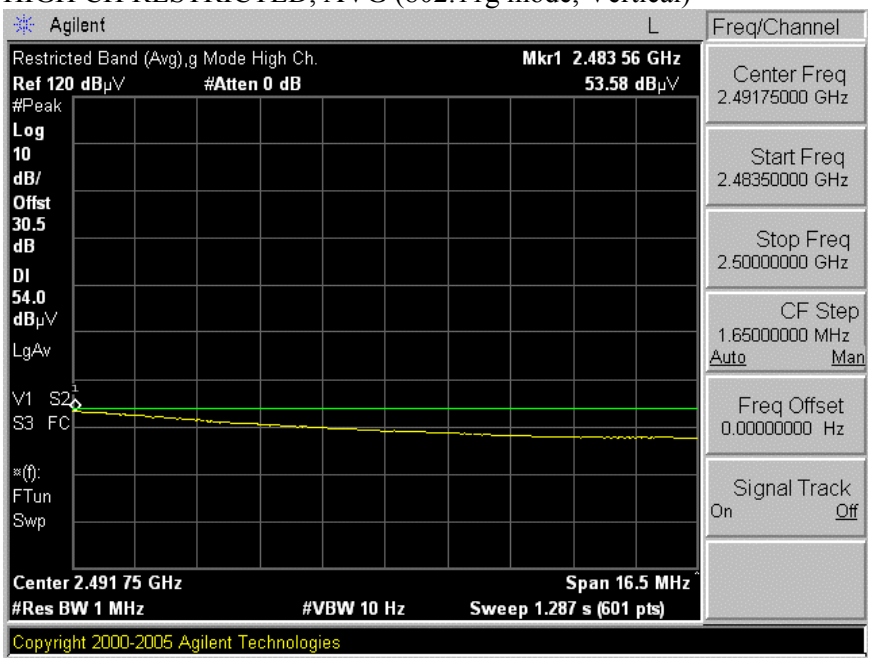


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2457 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Vertical)

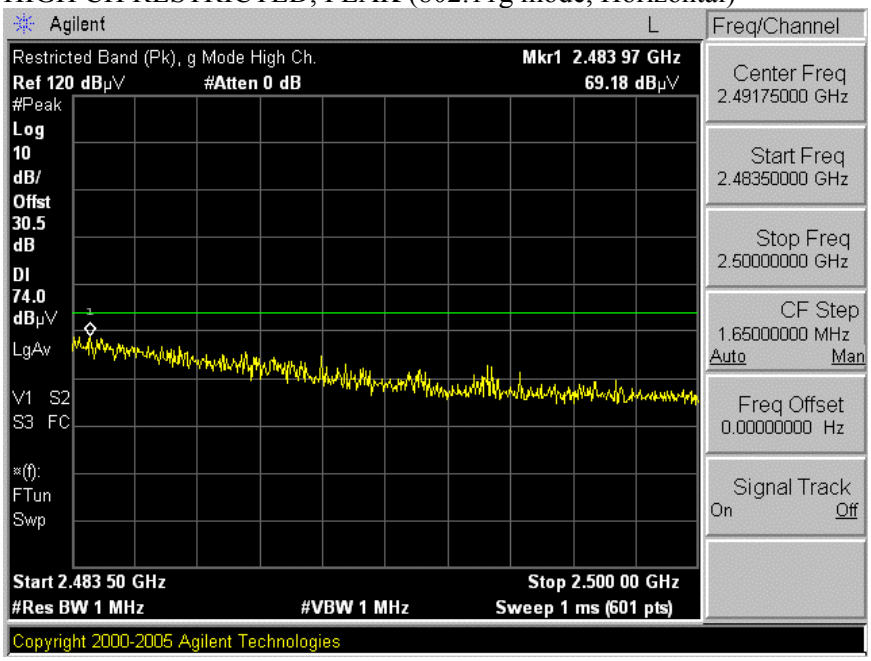


HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)

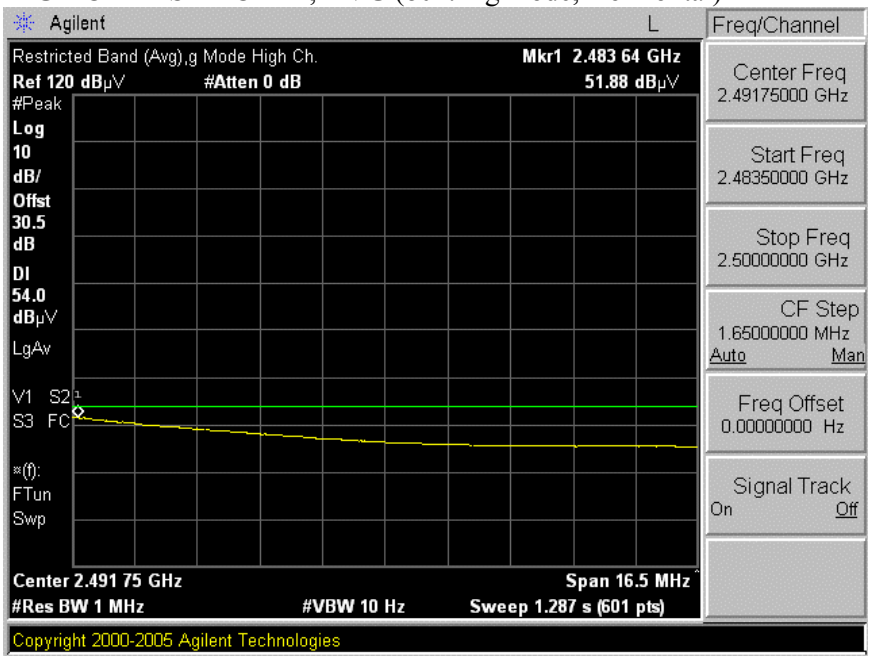


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2462 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Horizontal)

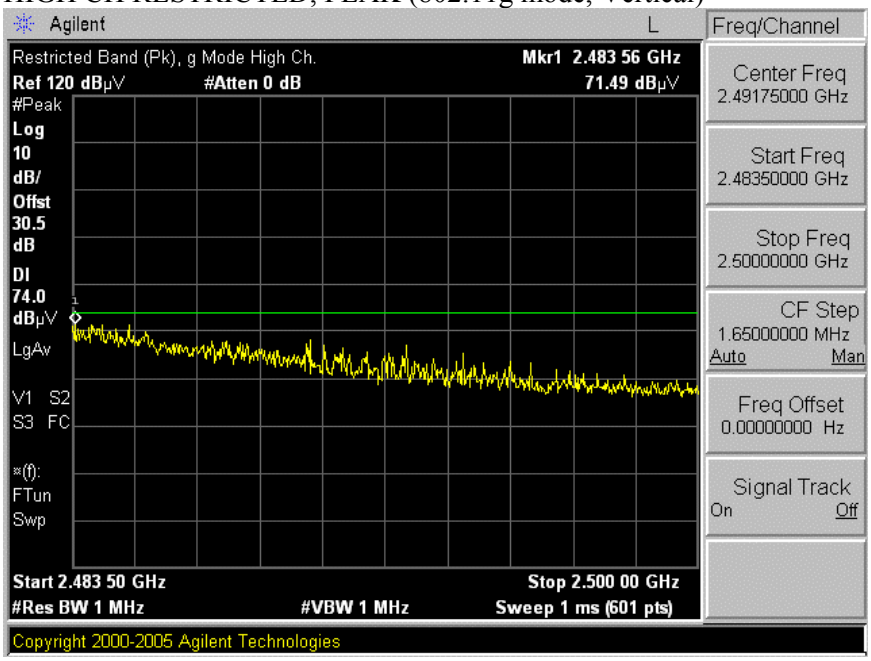


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

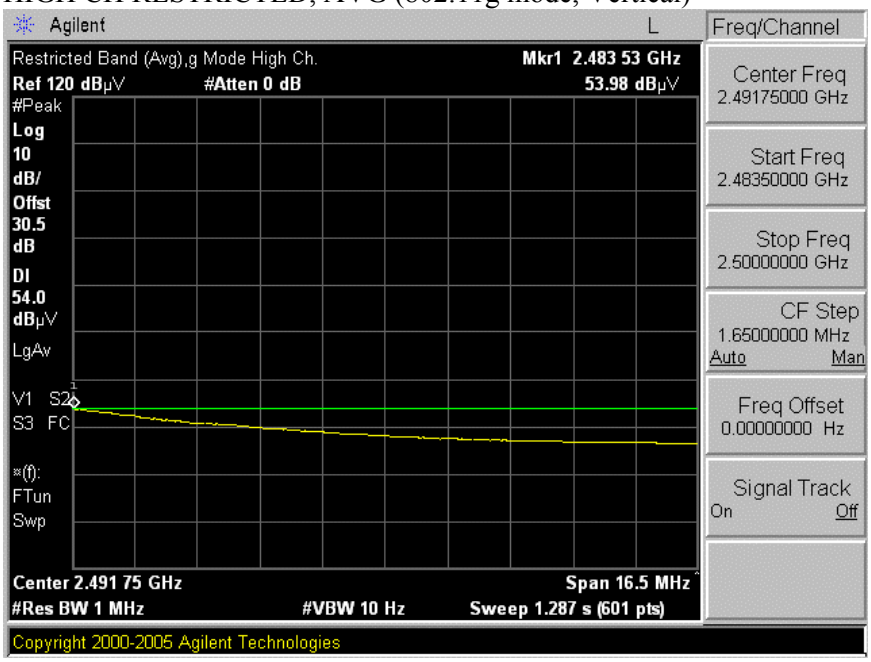


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2462 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (g MODE)

04/08/06 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer: Thanh Nguyen
Project #:06U10233-1
Company: BroadCom Corporation
EUT Description:802.11a/b/g Mini PCI card
EUT M/N: BCM94321MC
EUT S/N: 107
Test Target: FCC Part15.247
Mode Of Operation:Tx g Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Harmonics Spurious															
Low Channel															
4.824	3.0	47.12	37.62	33.7	2.8	-34.8	0.0	0.6	49.4	39.9	74	54	-24.6	-14.1	V
12.060	3.0	42.93	30.46	38.5	4.3	-32.5	0.0	0.9	54.2	41.7	74	54	-19.8	-12.3	V
4.824	3.0	50.03	45.38	33.7	2.8	-34.8	0.0	0.6	52.3	47.6	74	54	-21.7	-6.4	H
12.060	3.0	43.90	31.50	38.5	4.3	-32.5	0.0	0.9	55.1	42.7	74	54	-18.9	-11.3	H
Mid Channel															
4.870	3.0	53.69	40.72	33.8	2.8	-34.8	0.0	0.6	56.0	43.1	74	54	-18.0	-10.9	V
7.311	3.0	43.56	30.79	35.5	3.3	-34.1	0.0	0.6	48.9	36.2	74	54	-25.1	-17.8	V
12.185	3.0	52.01	30.26	38.5	4.3	-32.5	0.0	0.9	63.3	41.5	74	54	-10.7	-12.5	V
4.874	3.0	54.34	50.14	33.8	2.8	-34.8	0.0	0.6	56.7	52.5	74	54	-17.3	-1.5	H
7.311	3.0	44.66	31.71	35.5	3.3	-34.1	0.0	0.6	50.0	37.1	74	54	-24.0	-16.9	H
12.185	3.0	42.27	30.26	38.5	4.3	-32.5	0.0	0.9	53.5	41.5	74	54	-20.5	-12.5	H
High Channel															
4.924	3.0	50.50	39.21	33.8	2.8	-34.8	0.0	0.6	53.0	41.7	74	54	-21.0	-12.3	V
7.386	3.0	46.09	33.79	35.6	3.3	-34.1	0.0	0.6	51.6	39.3	74	54	-22.4	-14.7	V
12.310	3.0	42.41	30.23	38.5	4.4	-32.5	0.0	0.9	53.7	41.5	74	54	-20.3	-12.5	V
4.924	3.0	55.39	50.09	33.8	2.8	-34.8	0.0	0.6	57.8	52.5	74	54	-16.2	-1.5	H
7.386	3.0	50.74	35.53	35.6	3.3	-34.1	0.0	0.6	56.2	41.0	74	54	-17.8	-13.0	H
12.310	3.0	43.21	30.27	38.5	4.4	-32.5	0.0	0.9	54.5	41.6	74	54	-19.5	-12.4	H
Spurious Emissions															
1.057	3.0	60.01	43.42	24.0	1.3	-38.2	0.0	0.0	47.2	30.6	74	54	-26.8	-23.4	V
1.065	3.0	59.42	43.30	24.1	1.3	-38.2	0.0	0.0	46.6	30.5	74	54	-27.4	-23.5	H
1.195	3.0	39.94	56.81	24.5	1.4	-38.0	0.0	0.0	27.8	44.7	74	54	-46.2	-9.3	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

HARMONICS AND SPURIOUS EMISSIONS (g MODE)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10708
Date: 12/15/06
Test Engineer: Vien Tran
Configuration: EUT & Antenna
Mode: Tx_2.4 GHz Band_11g CH6

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
MID CH , 2437 MHz															
4.874	3.0	52.4	47.8	33.7	3.4	-36.5	0.0	0.6	53.7	49.1	74	54	-20.3	-4.9	H
4.874	3.0	47.1	38.3	33.7	3.4	-36.5	0.0	0.6	48.4	39.6	74	54	-25.6	-14.4	V

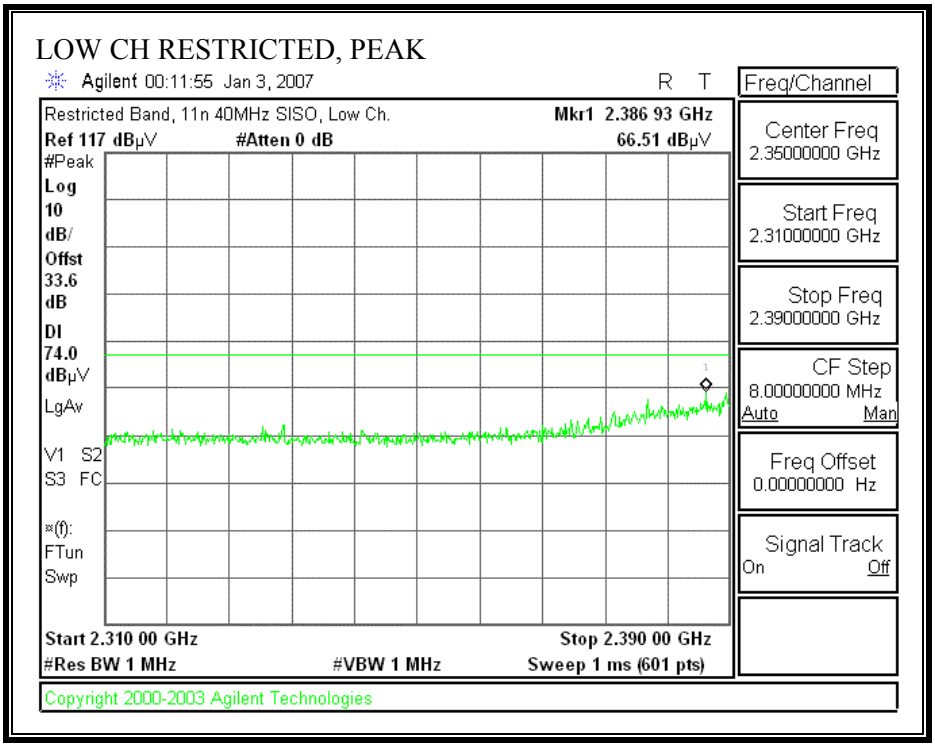
Note: No other emissions were detected above the system noise floor

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

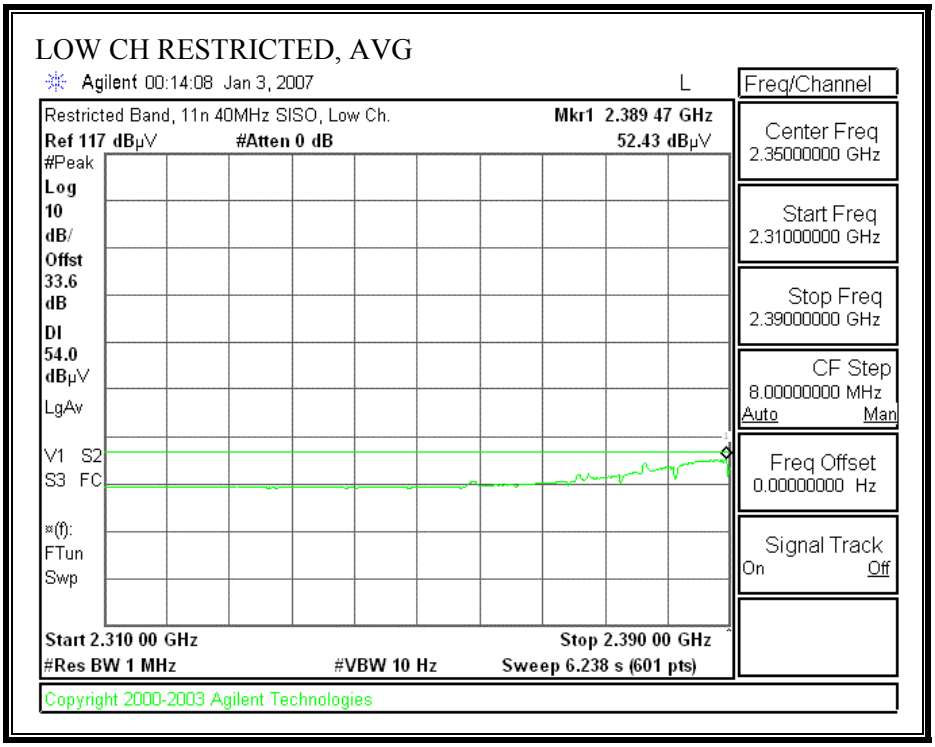
802.11n Mode 20 MHz SISO is covered by the worst case 802.11g mode Legacy testing.

802.11n Mode 40 MHz SISO

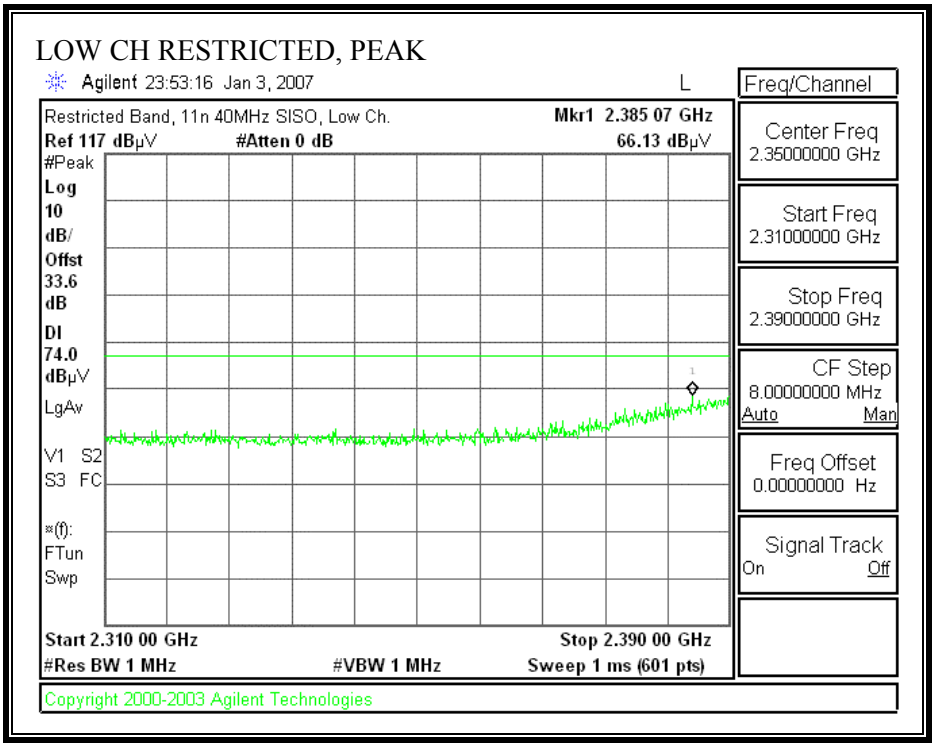
LOW CHANNEL, 2422 MHz, HORIZONTAL



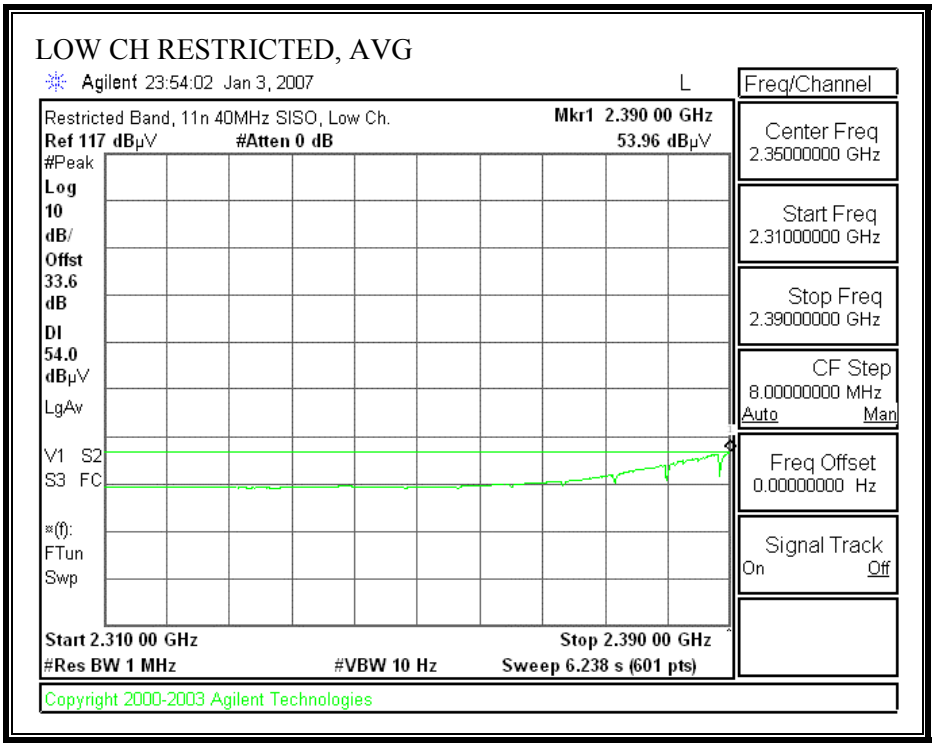
LOW CH RESTRICTED, AVG



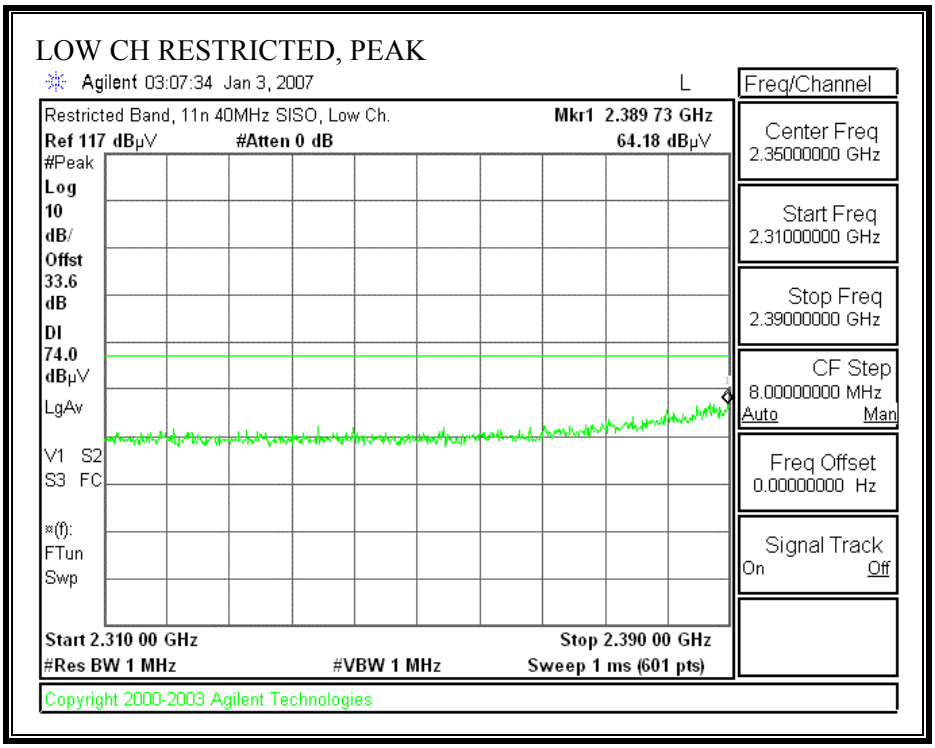
RESTRICTED BANDEDGE (LOW CHANNEL, 2422 MHz, VERTICAL)



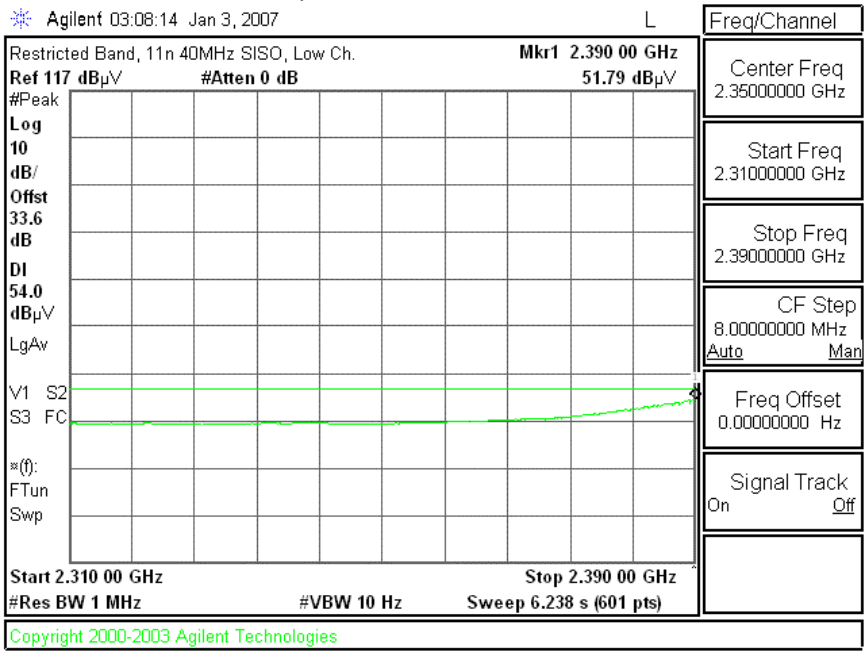
LOW CH RESTRICTED, AVG



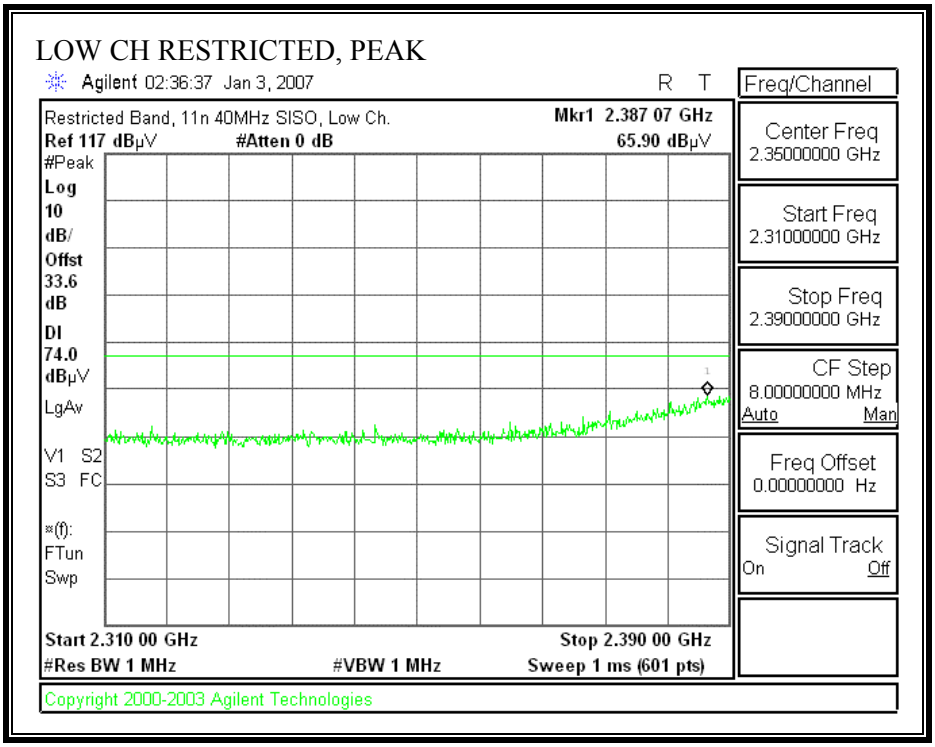
RESTRICTED BANDEDGE (LOW CHANNEL, 2427 MHz, HORIZONTAL)



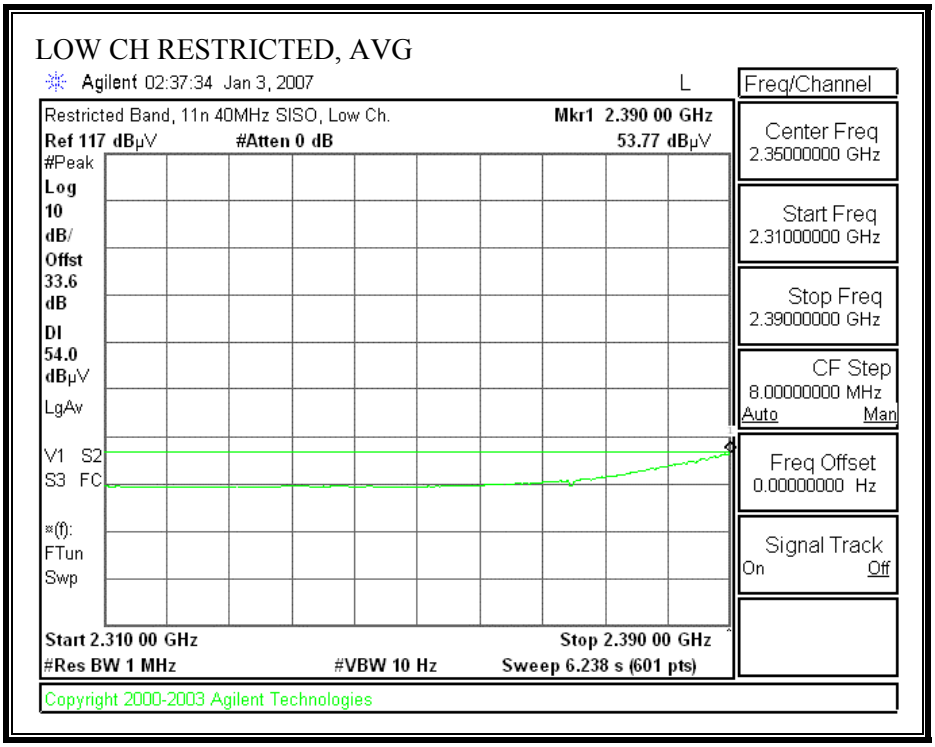
LOW CH RESTRICTED, AVG



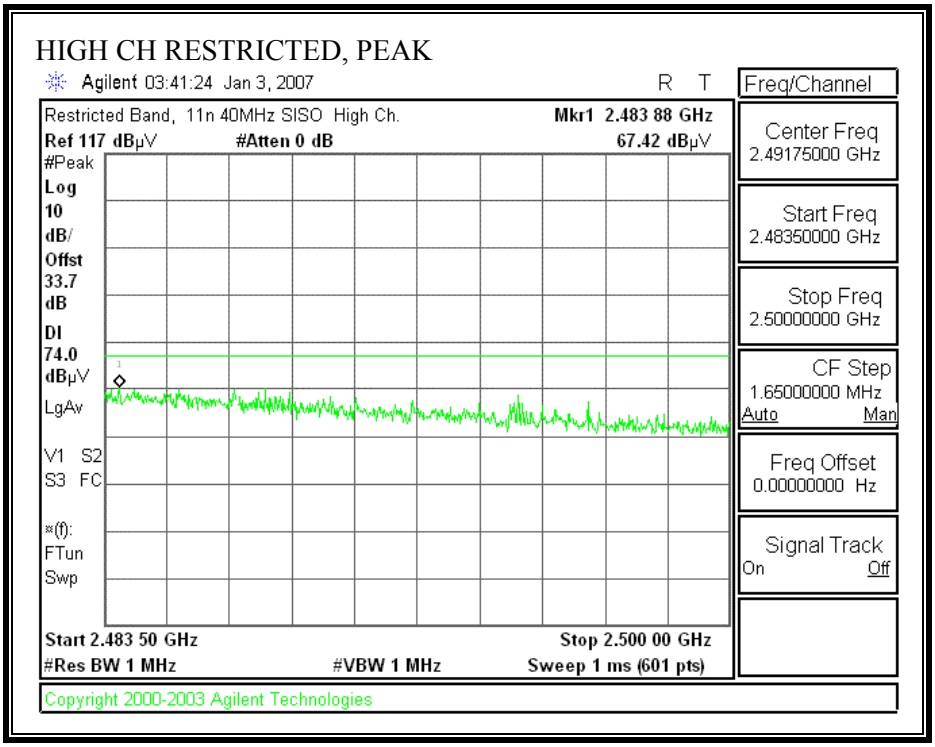
RESTRICTED BANDEDGE (LOW CHANNEL, 2427 MHz, VERTICAL)



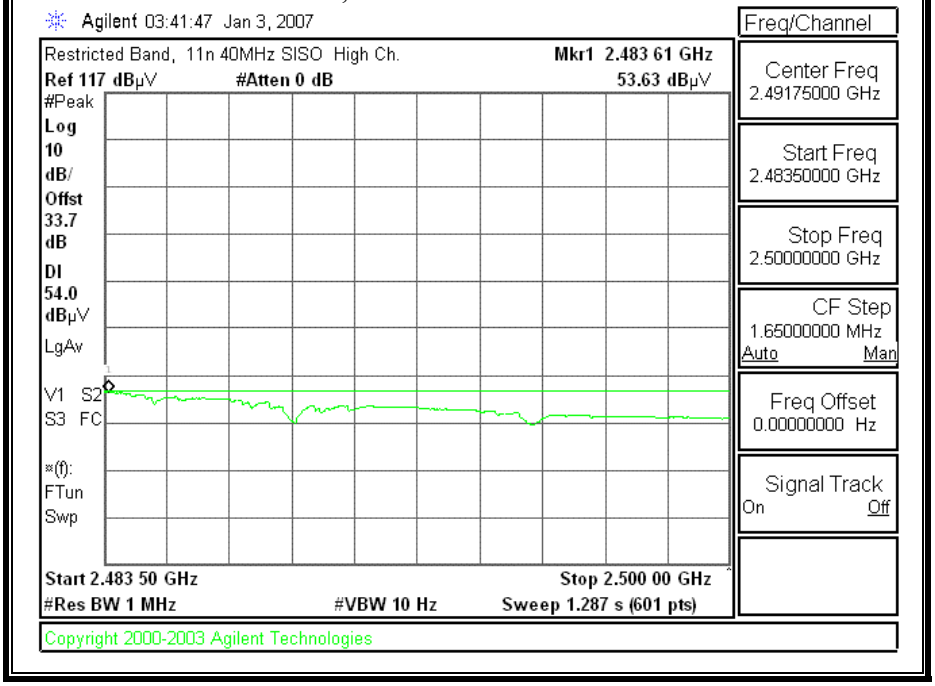
LOW CH RESTRICTED, AVG



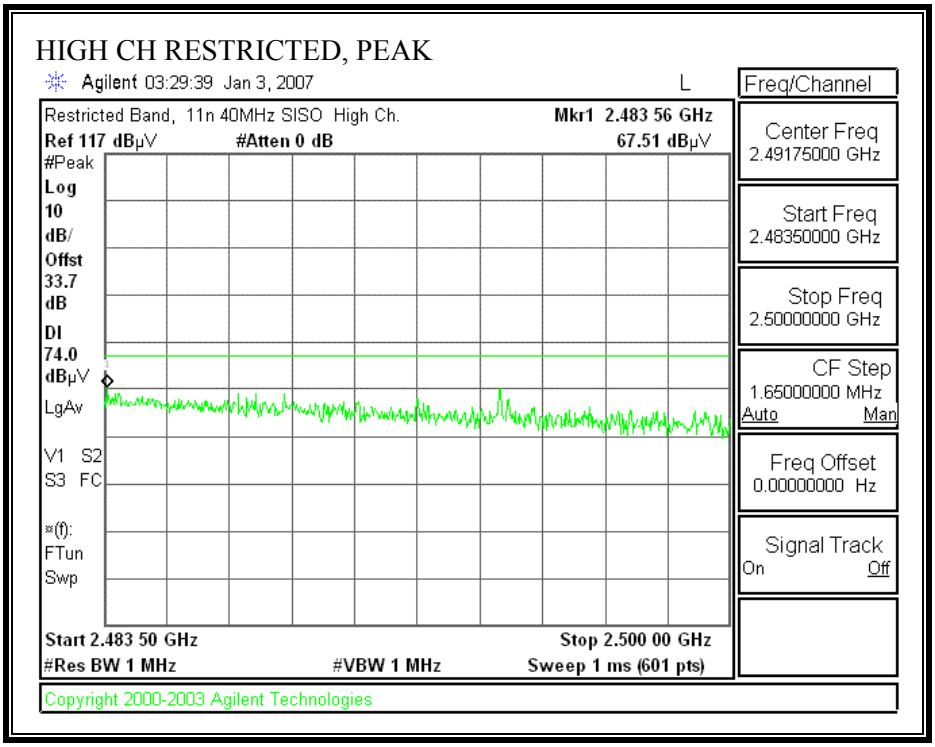
RESTRICTED BANDEDGE (HIGHCHANNEL, 2447MHz, HORIZONTAL)



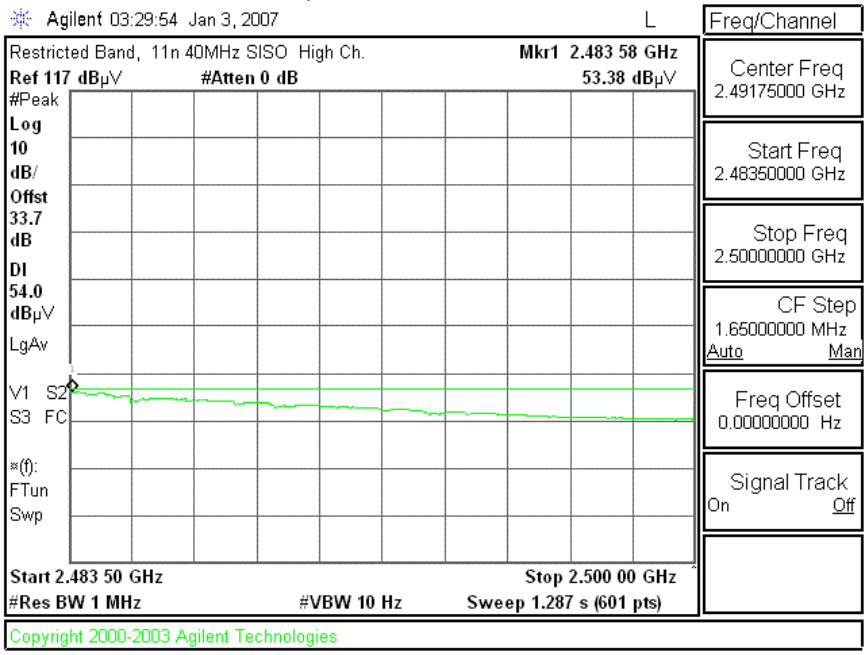
HIGH CH RESTRICTED, AVG



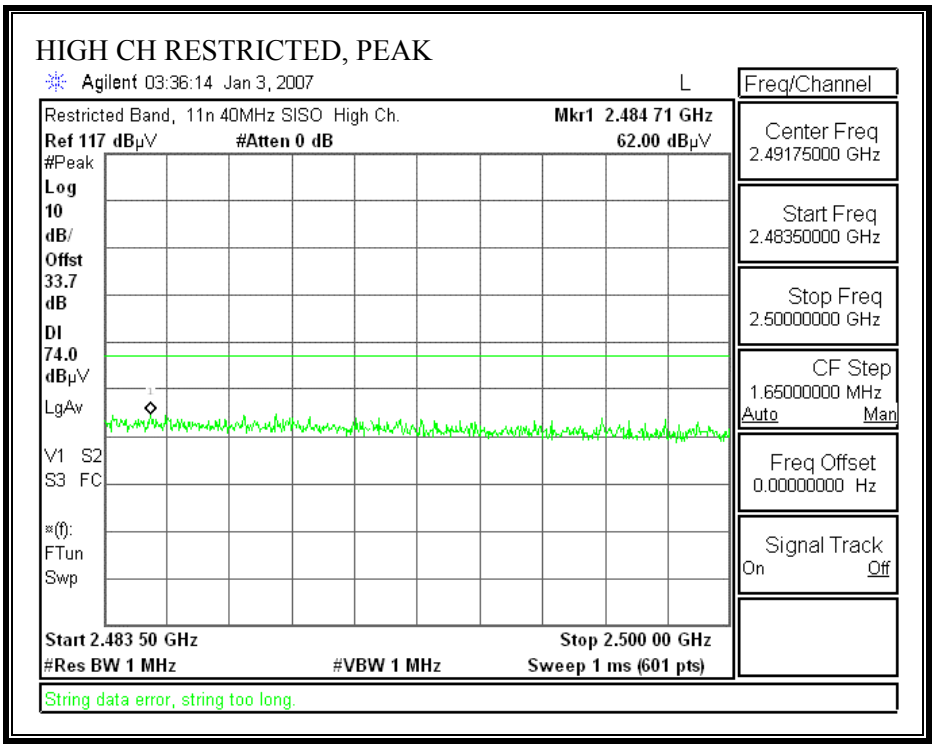
RESTRICTED BANDEDGE (HIGH CHANNEL, 2447 MHz, VERTICAL)



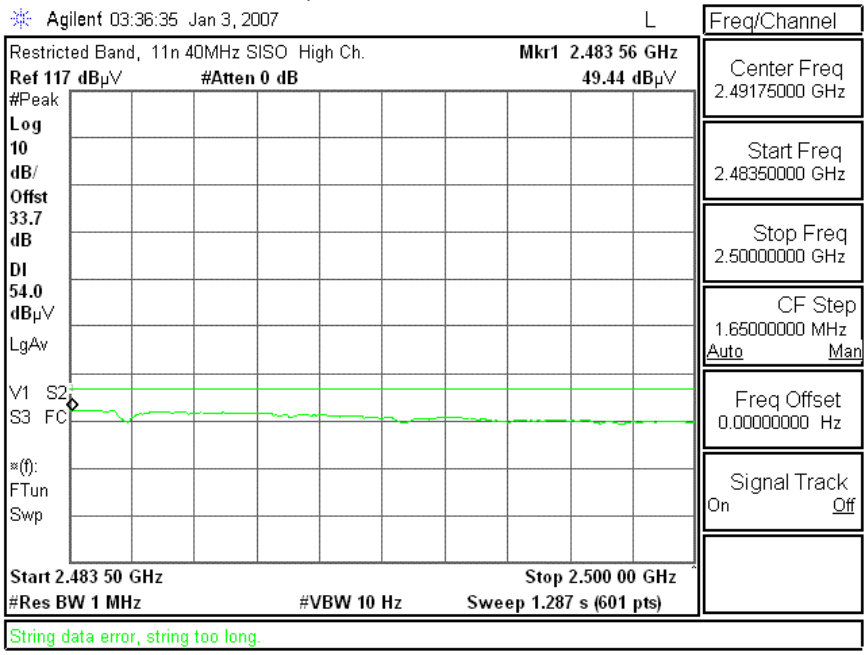
HIGH CH RESTRICTED, AVG



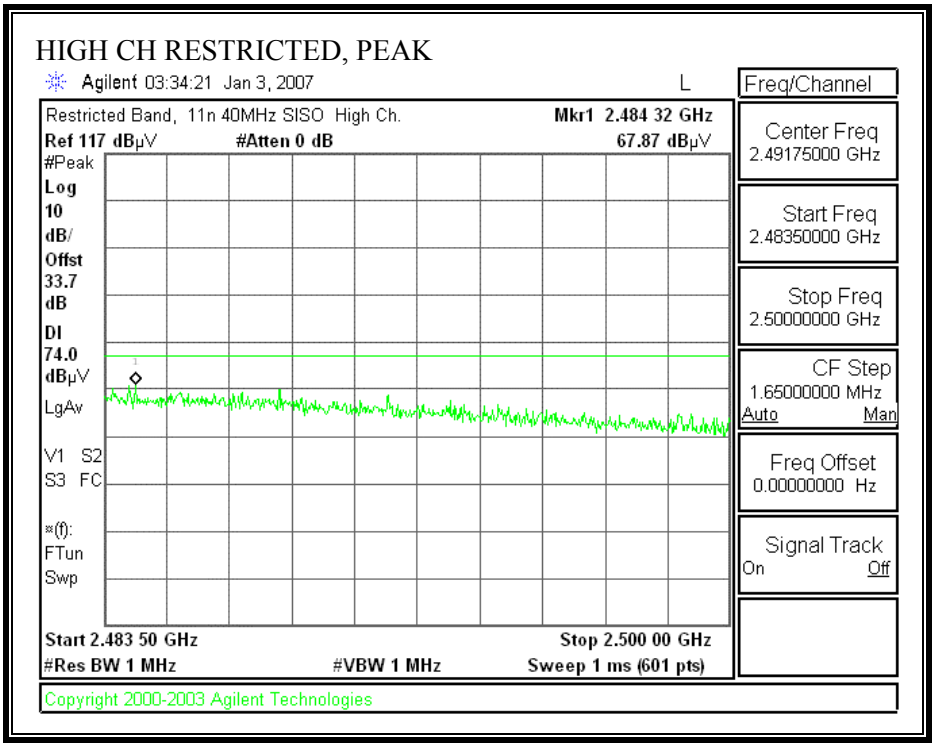
RESTRICTED BANDEDGE (HIGH CHANNEL, 2452 MHz, HORIZONTAL)



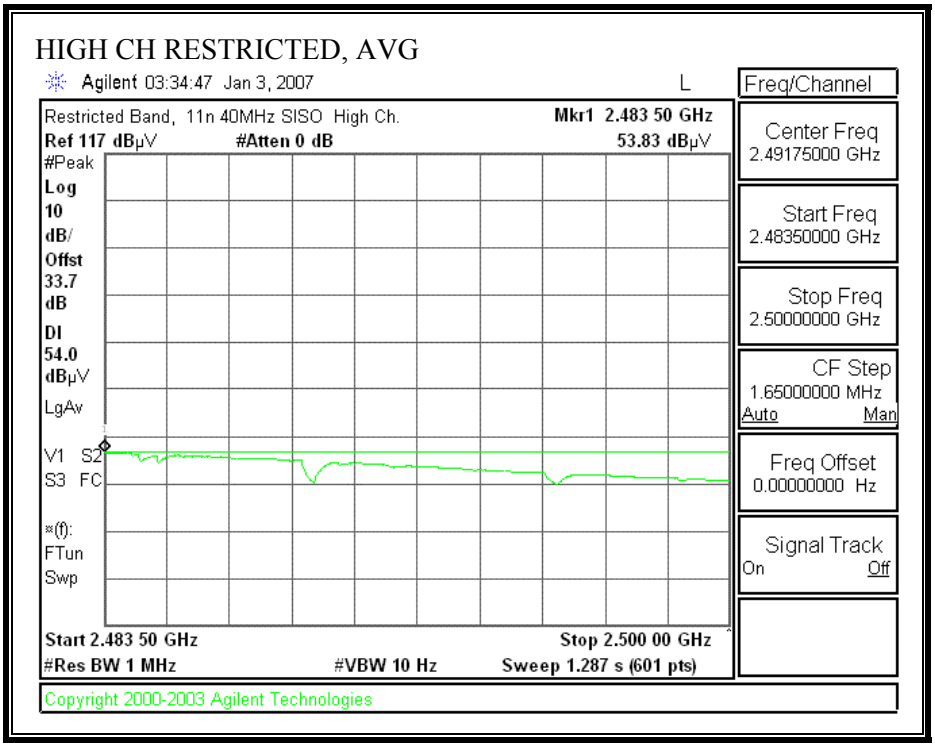
HIGH CH RESTRICTED, AVG



RESTRICTED BANDEDGE (HIGH CHANNEL, 2452 MHz, VERTICAL)



HIGH CH RESTRICTED, AVG



HARMONICS AND SPURIOUS EMISSIONS (11n Mode 40 MHz SISO)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10708
Date: 01/05/07
Test Engineer: Vien Tran
Configuration: EUT & Dell Antenna
Mode: Tx 2.4 GHz_11n 40MHz SISO

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T87 Miteq 924342			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Ch 3, 2422 MHz															
4.874	3.0	55.4	47.7	33.7	3.4	-45.3	0.0	0.6	47.8	40.1	74	54	-26.2	-13.9	V
7.311	3.0	53.6	43.1	35.2	3.9	-43.2	0.0	0.6	50.1	39.6	74	54	-23.9	-14.4	V
4.874	3.0	58.3	56.3	33.7	3.4	-45.3	0.0	0.6	50.7	48.7	74	54	-23.3	-5.3	H
7.311	3.0	55.7	42.3	35.2	3.9	-43.2	0.0	0.6	52.2	38.8	74	54	-21.8	-15.2	H
Ch 6, 2437 MHz															
4.874	3.0	55.8	47.6	33.7	3.4	-45.3	0.0	0.6	48.2	40.0	74	54	-25.8	-14.0	V
7.311	3.0	53.7	41.9	35.2	3.9	-43.2	0.0	0.6	50.2	38.4	74	54	-23.8	-15.6	V
4.874	3.0	61.6	57.3	33.7	3.4	-45.3	0.0	0.6	54.0	49.7	74	54	-20.0	-4.3	H
7.311	3.0	58.5	44.6	35.2	3.9	-43.2	0.0	0.6	55.0	41.1	74	54	-19.0	-12.9	H
Ch 9, 2452 MHz															
4.904	3.0	55.5	47.2	33.8	3.4	-45.3	0.0	0.6	48.0	39.7	74	54	-26.0	-14.3	V
7.356	3.0	52.7	41.8	35.2	3.9	-43.1	0.0	0.6	49.3	38.4	74	54	-24.7	-15.6	V
4.904	3.0	61.3	56.9	33.8	3.4	-45.3	0.0	0.6	53.8	49.4	74	54	-20.2	-4.6	H
7.356	3.0	56.8	43.5	35.2	3.9	-43.1	0.0	0.6	53.4	40.1	74	54	-20.6	-13.9	H
			No other emissions were detected above system noise floor												

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.5.3. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND

802.11a Legacy Mode

HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

04/08/06 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer: Thanh Nguyen
Project #:06U10233-1
Company: BroadCom Corporation
EUT Description:2x2 Dual Band MIMO Device
EUT M/N: BCM94321MC
EUT S/N: 107
Test Target: FCC Part15.247
Mode Of Operation: Tx 5.8 GHz

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low 5745MHz															
11.490	3.0	47.0	34.3	38.3	4.2	-32.5	0.0	0.7	57.7	45.0	74	54	-16.3	-9.0	V
17.235	3.0	42.3	30.4	42.4	5.2	-32.0	0.0	0.6	58.4	46.6	74	54	-15.6	-7.4	V
11.490	3.0	54.1	37.8	38.3	4.2	-32.5	0.0	0.7	64.7	48.5	74	54	-9.3	-5.5	H
17.235	3.0	42.9	30.2	42.4	5.2	-32.0	0.0	0.6	59.1	46.4	74	54	-14.9	-7.6	H
Tx Mid Ch 5785MHz															
11.570	3.0	51.7	35.9	38.3	4.2	-32.5	0.0	0.7	62.4	46.6	74	54	-11.6	-7.4	H
17.355	3.0	41.7	30.3	43.0	5.2	-32.1	0.0	0.6	58.5	47.1	74	54	-15.5	-6.9	H
11.570	3.0	47.6	32.5	38.3	4.2	-32.5	0.0	0.7	58.3	43.2	74	54	-15.7	-10.8	V
17.355	3.0	43.0	30.4	43.0	5.2	-32.1	0.0	0.6	59.9	47.2	74	54	-14.1	-6.8	V
Tx High Ch 5825MHz															
11.650	3.0	49.3	33.8	38.5	4.8	-32.5	0.0	0.7	60.8	45.3	74	54	-13.2	-8.7	H
11.650	3.0	48.8	34.4	38.5	4.8	-32.5	0.0	0.7	60.4	45.9	74	54	-13.6	-8.1	V
17.475	3.0	45.3	31.4	42.2	6.3	-32.1	0.0	0.6	62.3	48.3	74	54	-11.7	-5.7	V
17.475	3.0	44.9	31.4	42.2	6.3	-32.1	0.0	0.6	61.9	48.4	74	54	-12.1	-5.6	H
23.300	3.0	46.1	32.9	33.7	7.4	-32.8	0.0	0.0	54.4	41.2	74	54	-19.6	-12.8	H
23.300	3.0	45.9	33.0	33.7	7.4	-32.8	0.0	0.0	54.1	41.3	74	54	-19.9	-12.7	V

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

802.11n Mode 20 MHz SISO is covered by the worst case 802.11a Mode Legacy testing.

802.11n a MODE 40 MHz SISO

HARMONICS AND SPURIOUS EMISSIONS (802.11n a MODE 40 MHz SISO)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: BroadCom
Project #: 06U10708
Date: 01/08/2007
Test Engineer: Thanh Nguyen
Configuration: EUT, Hitachi Antenna, Laptop.
Mode: Transmit 5.8GHz_11n40MHz SISO

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A005(			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Ch. 151															
11.510	3.0	53.9	41.4	37.6	5.0	-33.1	0.0	0.7	64.2	51.7	74	54	-9.8	-2.3	V
17.265	3.0	44.4	30.6	40.3	6.0	-32.0	0.0	0.6	59.3	45.4	74	54	-14.7	-8.6	V
11.510	3.0	52.7	39.2	37.6	5.0	-33.1	0.0	0.7	63.0	49.5	74	54	-11.0	-4.5	H
17.265	3.0	43.0	30.5	40.3	6.0	-32.0	0.0	0.6	57.9	45.3	74	54	-16.1	-8.7	H
Ch. 159															
11.590	3.0	57.2	43.5	37.6	5.1	-33.0	0.0	0.7	67.6	53.9	74	54	-6.4	-0.1	V
17.385	3.0	42.9	30.7	40.4	6.0	-32.0	0.0	0.6	57.9	45.7	74	54	-16.1	-8.3	V
11.590	3.0	56.8	42.9	37.6	5.1	-33.0	0.0	0.7	67.2	53.3	74	54	-6.8	-0.7	H
17.385	3.0	43.9	30.1	40.4	6.0	-32.0	0.0	0.6	58.9	45.1	74	54	-15.1	-8.9	H
					No other spurious emissions were detected above 2nd Harmonic.										

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

MIMO MODE

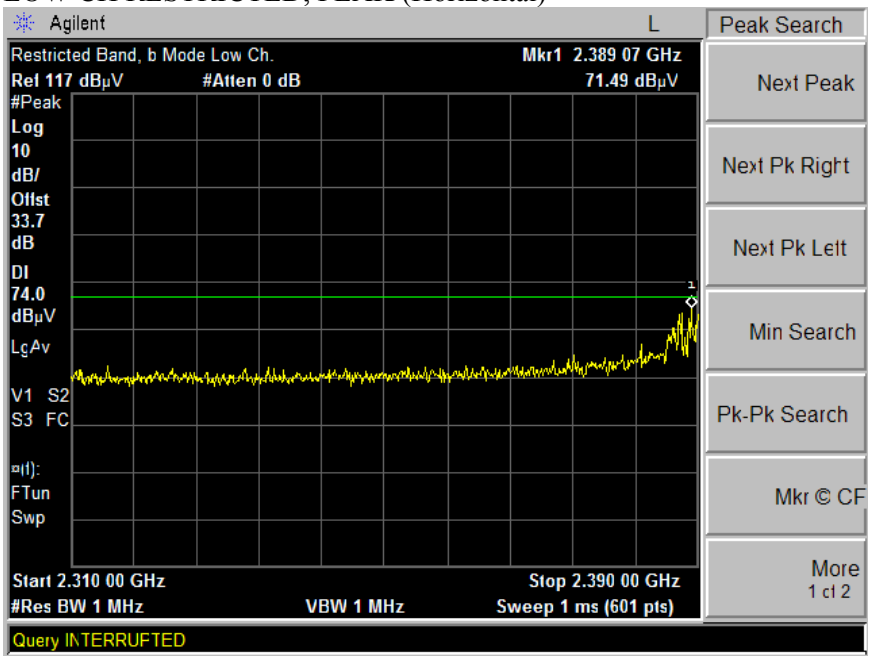
7.5.4. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

802.11g Mode Legacy CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0.

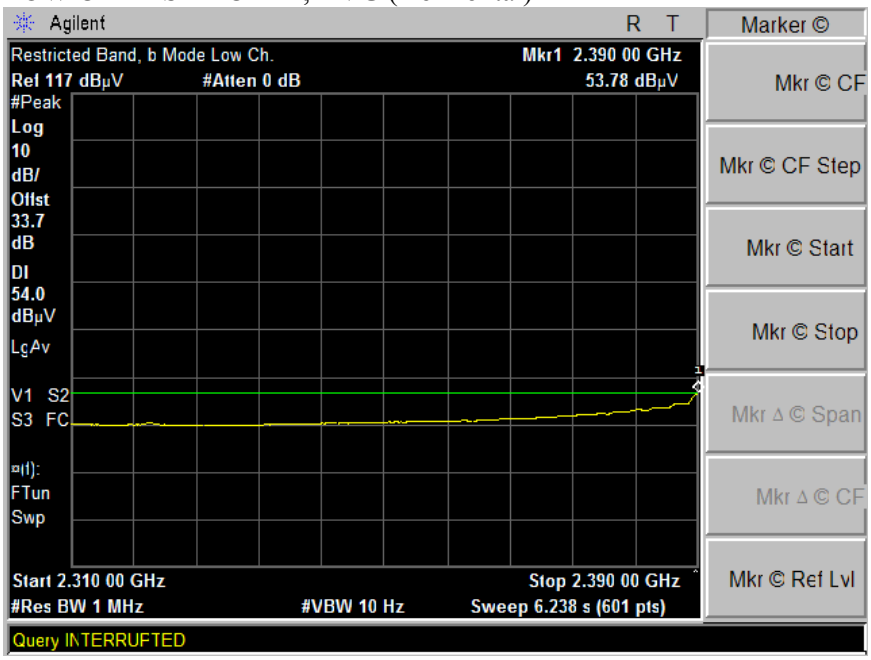
802.11n Mode 20 MHz CDD MCS 0:

RESTRICTED BANDEDGE (LOW CHANNEL, 2412 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Horizontal)

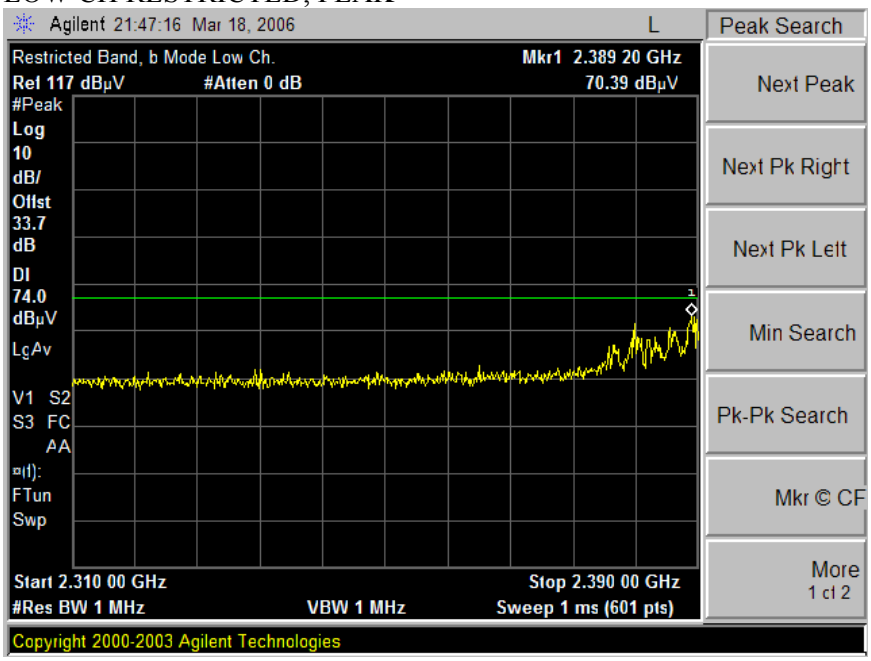


LOW CH RESTRICTED, AVG (Horizontal)

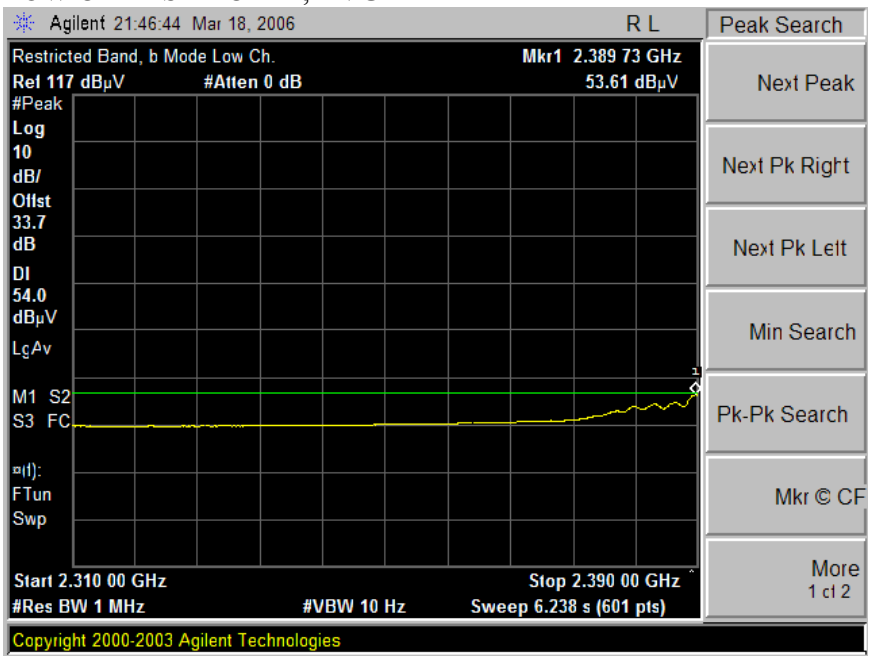


RESTRICTED BANDEDGE (LOW CHANNEL, 2412 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK

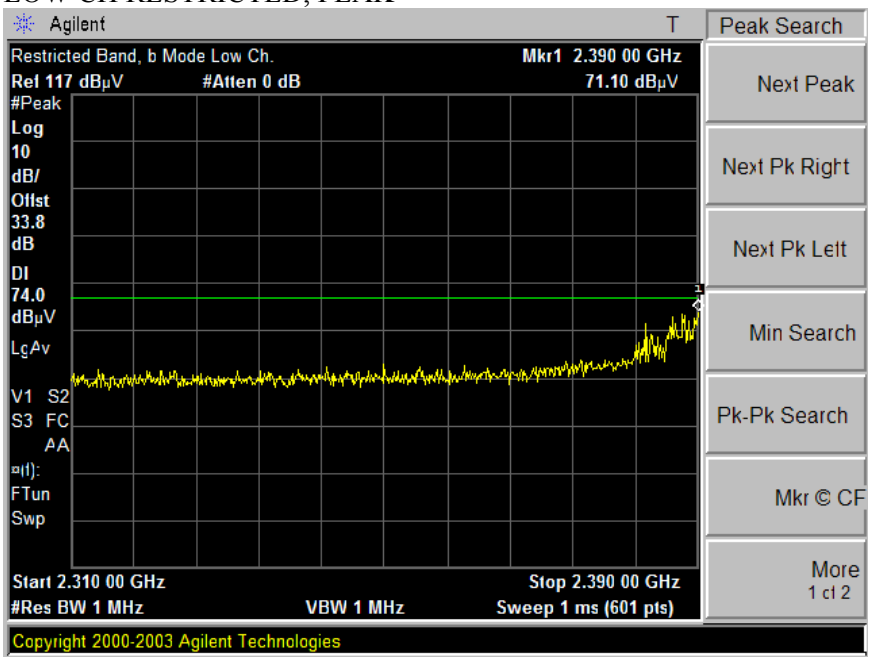


LOW CH RESTRICTED, AVG

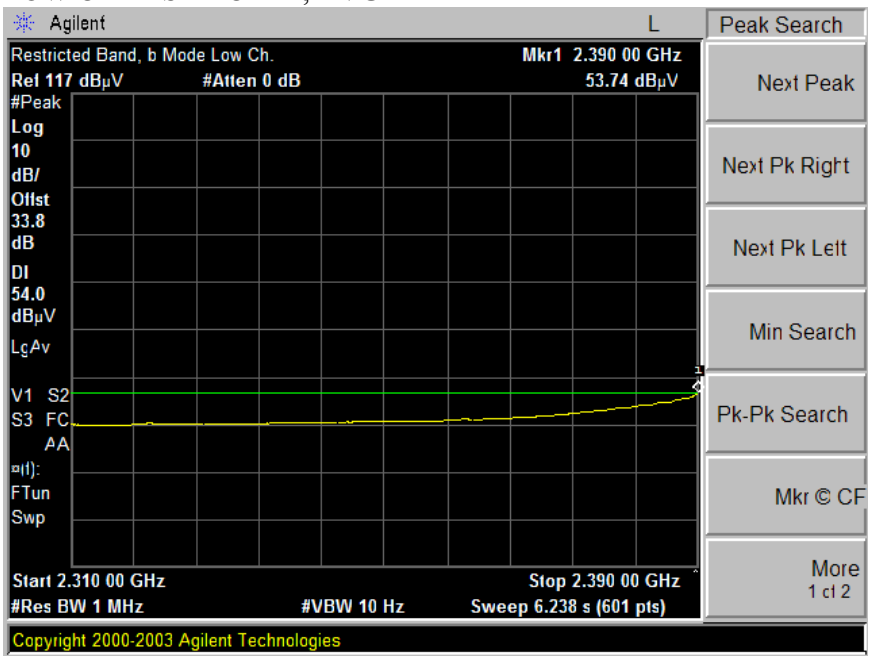


RESTRICTED BANDEDGE (LOW CHANNEL, 2417 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK

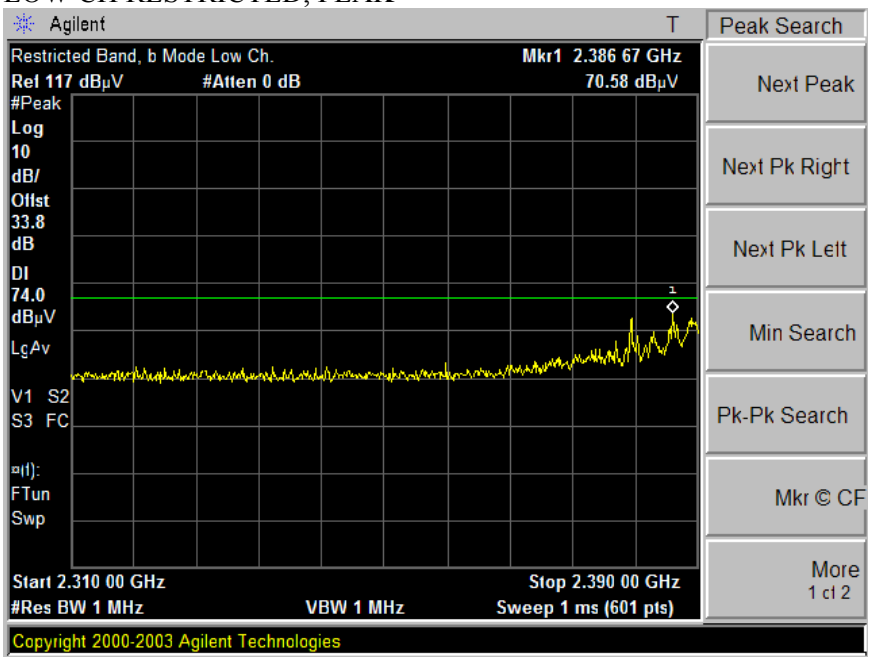


LOW CH RESTRICTED, AVG

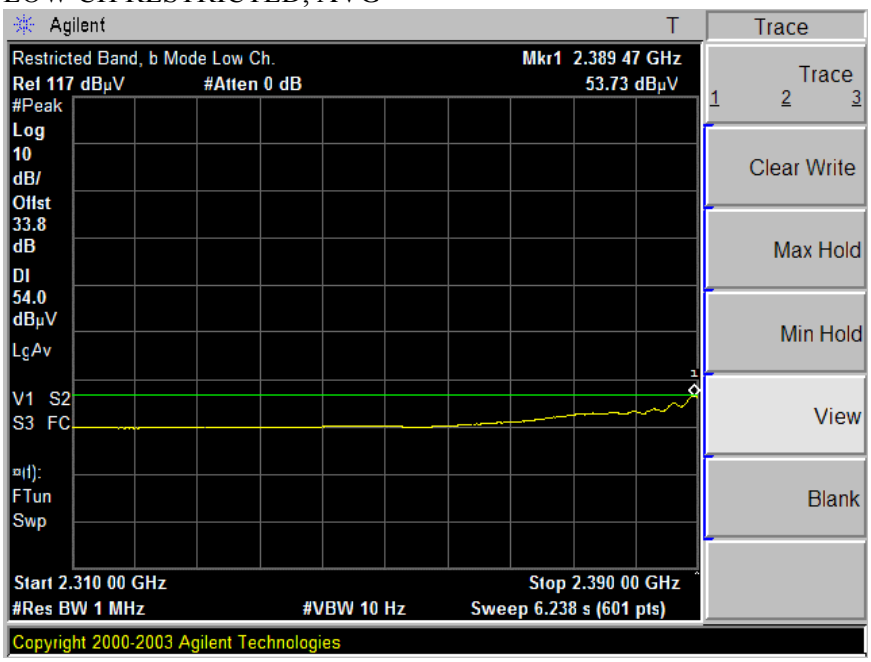


RESTRICTED BANDEDGE (LOW CHANNEL, 2417 MHz, VERTICAL)

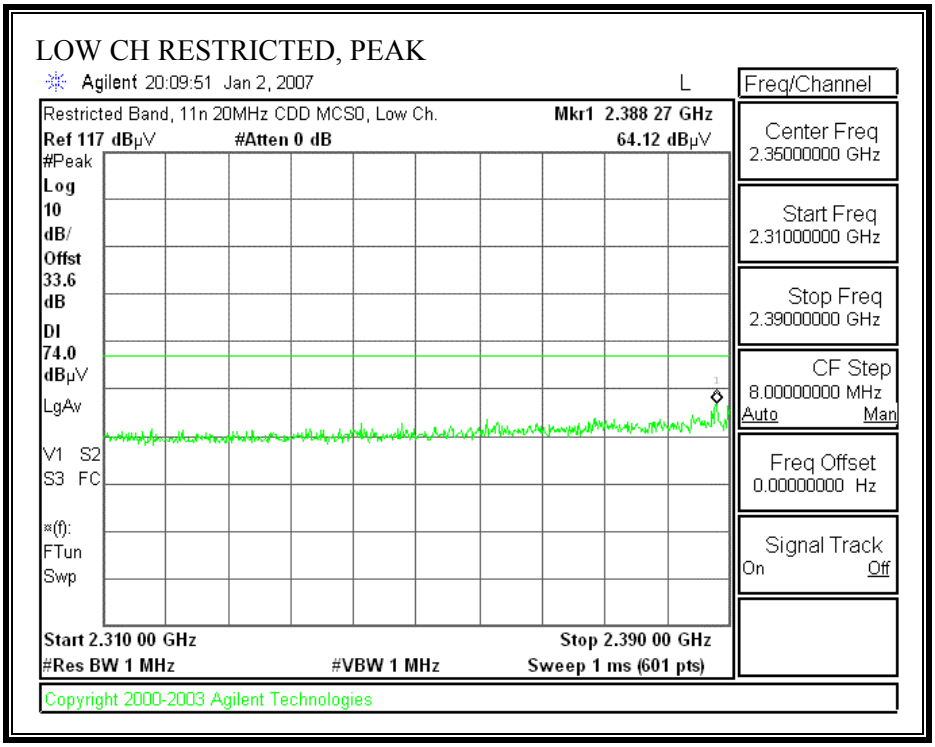
LOW CH RESTRICTED, PEAK



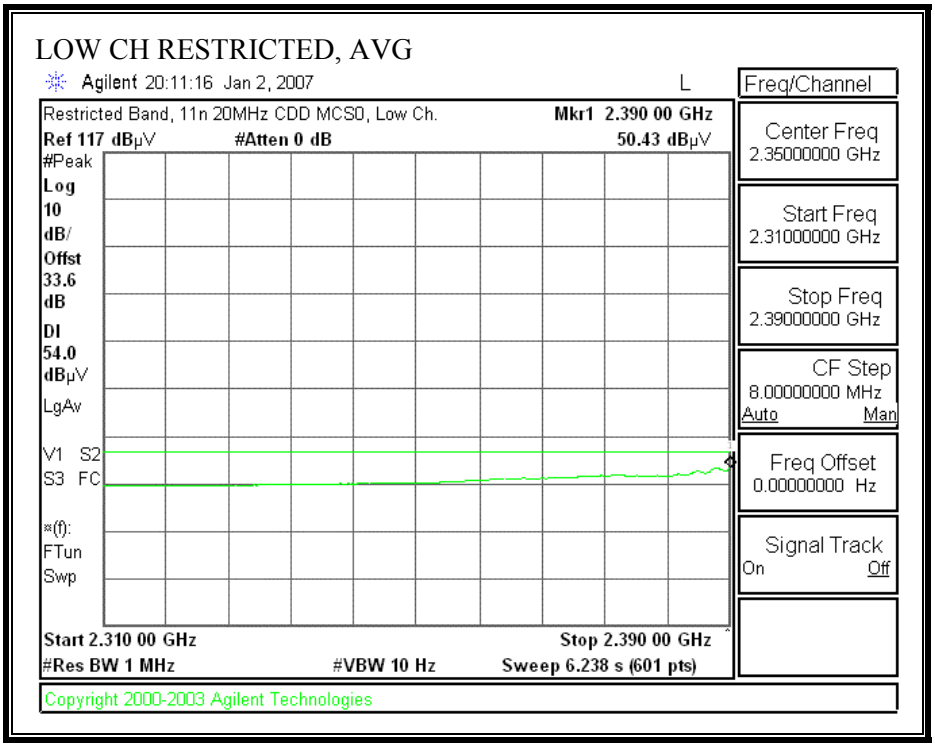
LOW CH RESTRICTED, AVG



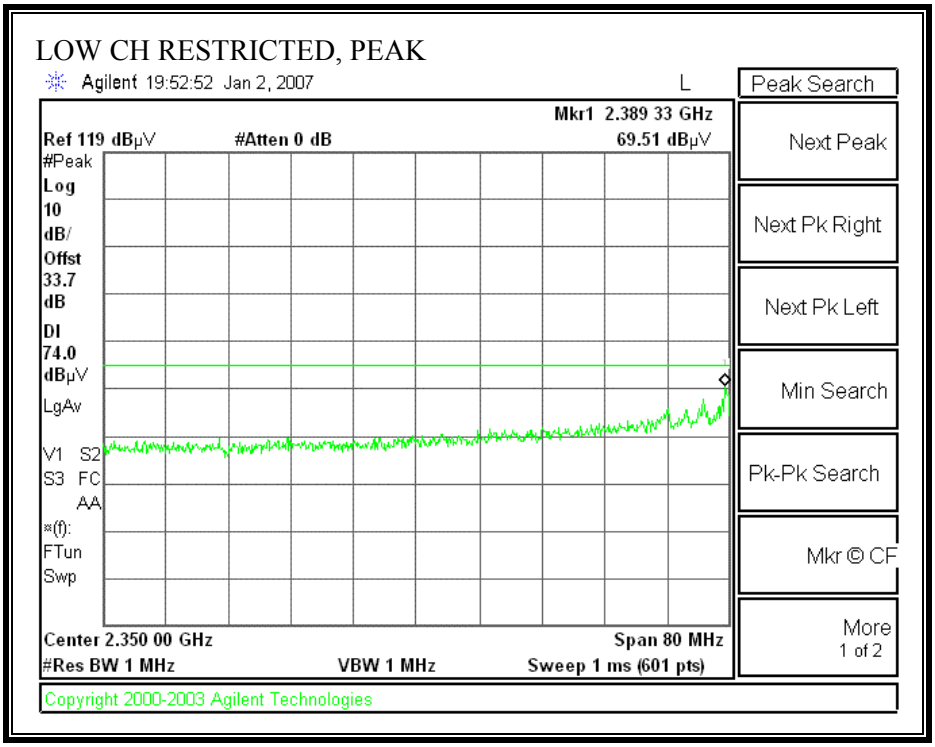
RESTRICTED BANDEDGE (LOW CHANNEL, 2422 MHz, HORIZONTAL)



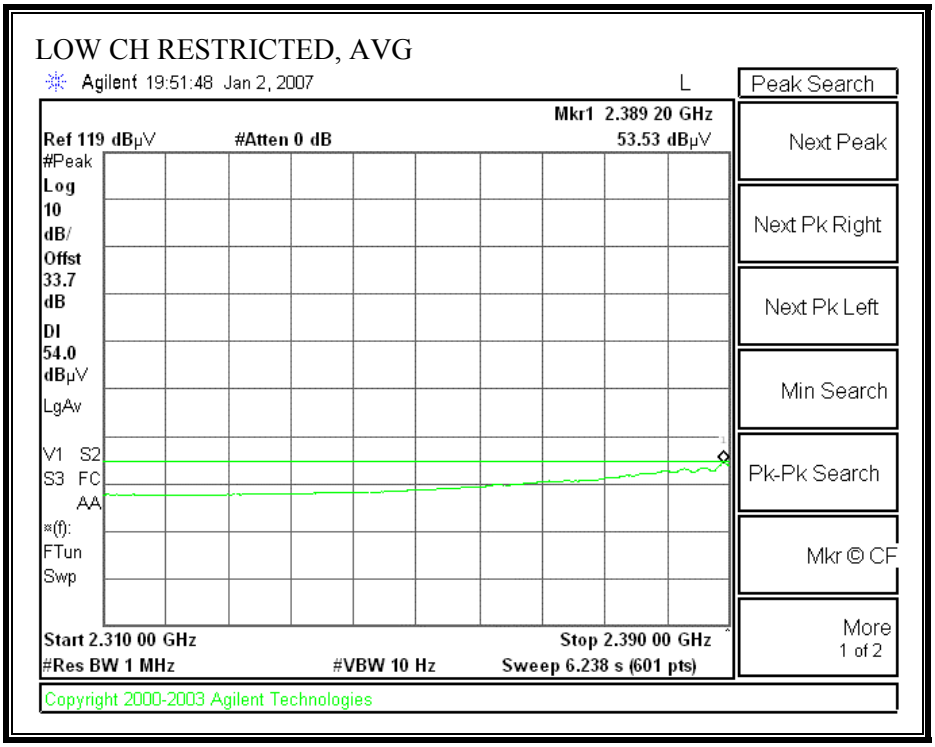
LOW CH RESTRICTED, AVG



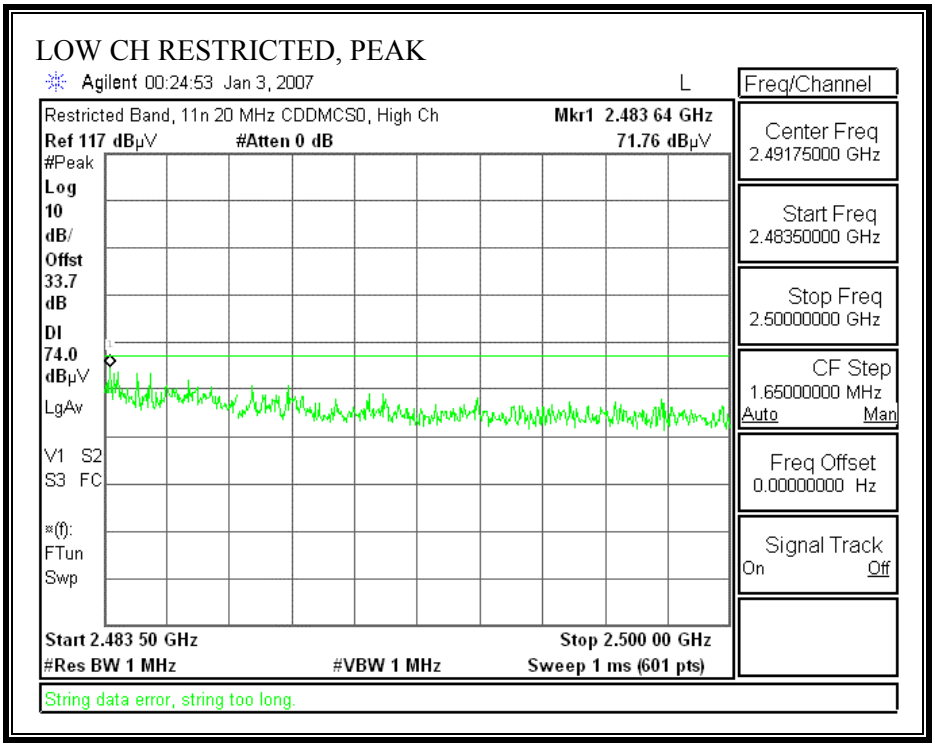
RESTRICTED BANDEDGE (LOW CHANNEL, 2422 MHz, VERTICAL)



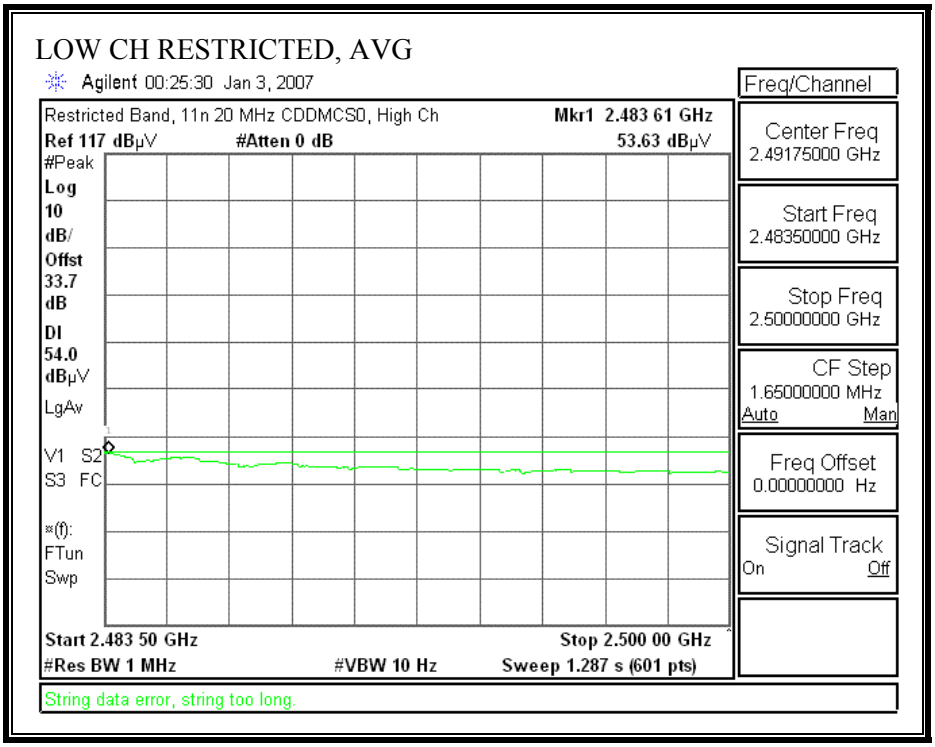
LOW CH RESTRICTED, AVG



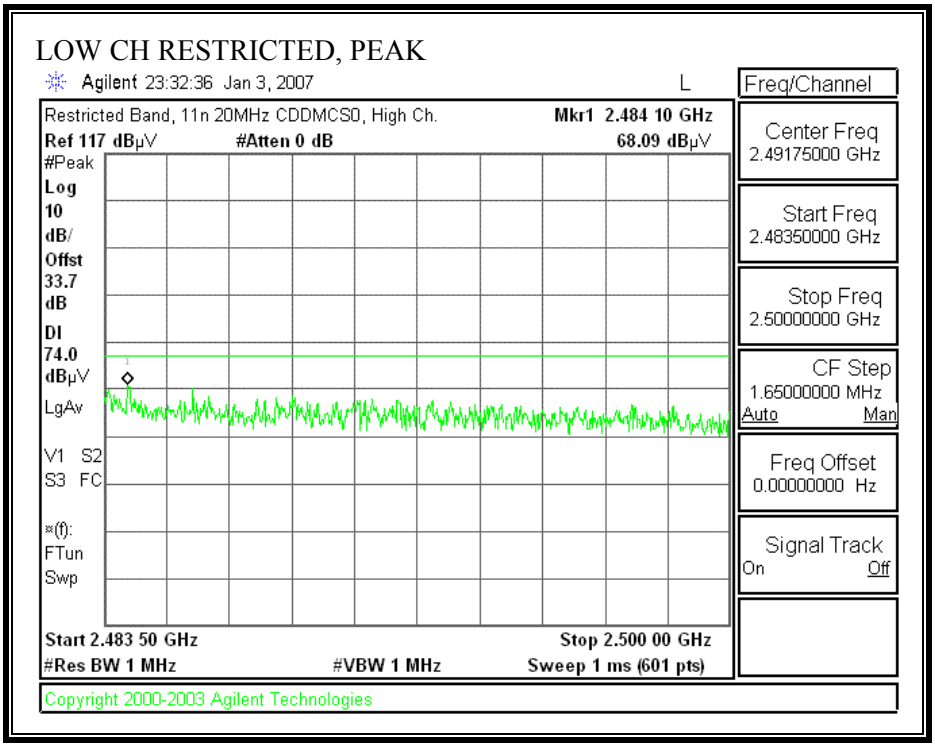
RESTRICTED BANDEDGE (LOW CHANNEL, 2452 MHz, HORIZONTAL)



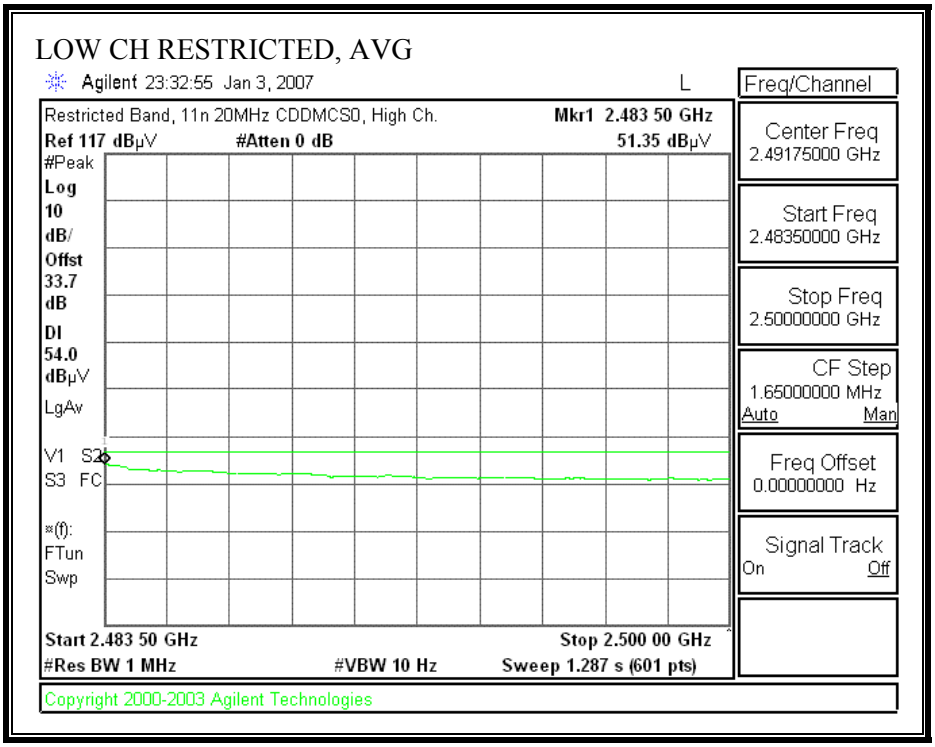
LOW CH RESTRICTED, AVG



RESTRICTED BANDEDGE (LOW CHANNEL, 2452 MHz, VERTICAL)

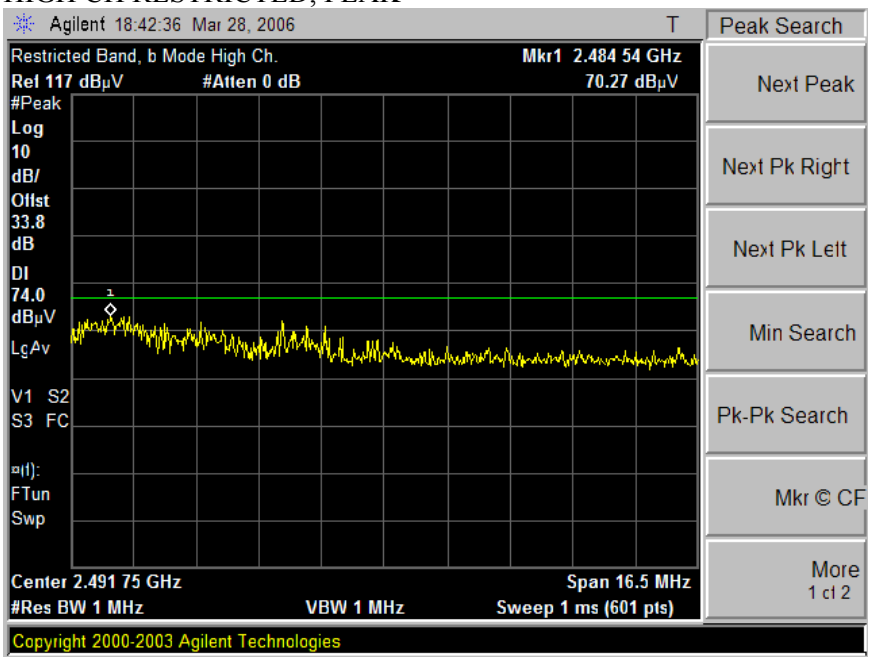


LOW CH RESTRICTED, AVG

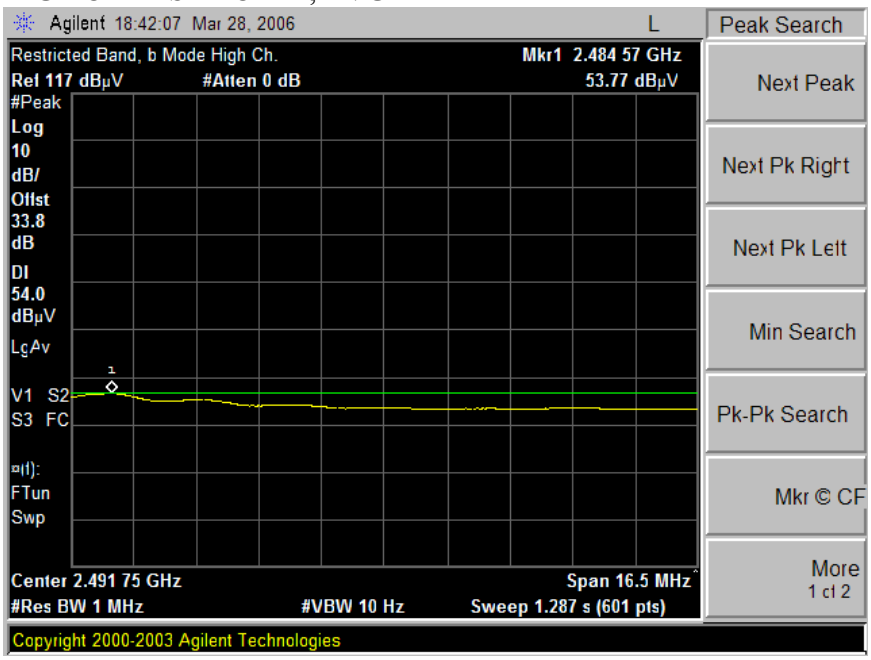


RESTRICTED BANDEDGE (HIGHCHANNEL, 2457 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK

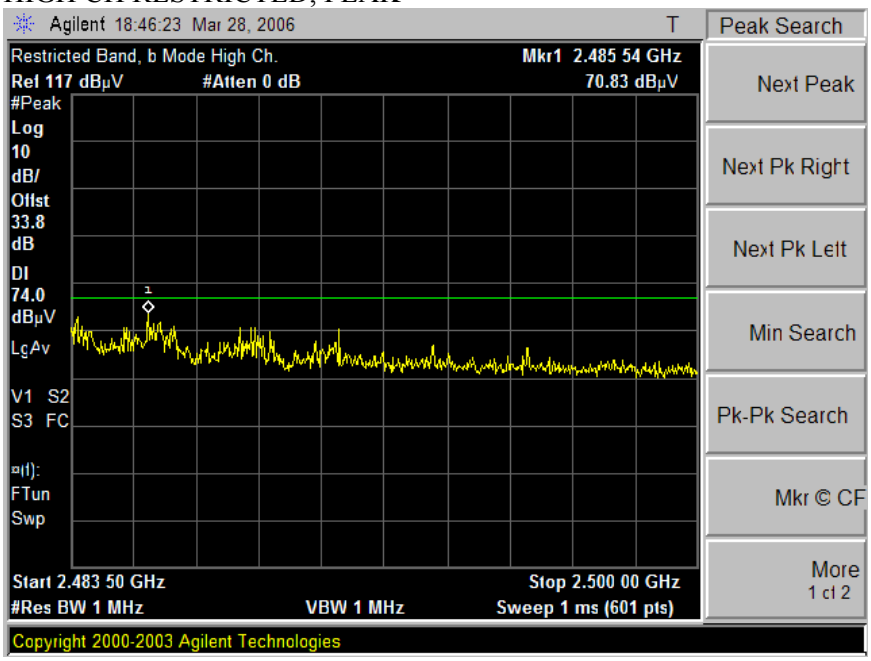


HIGH CH RESTRICTED, AVG

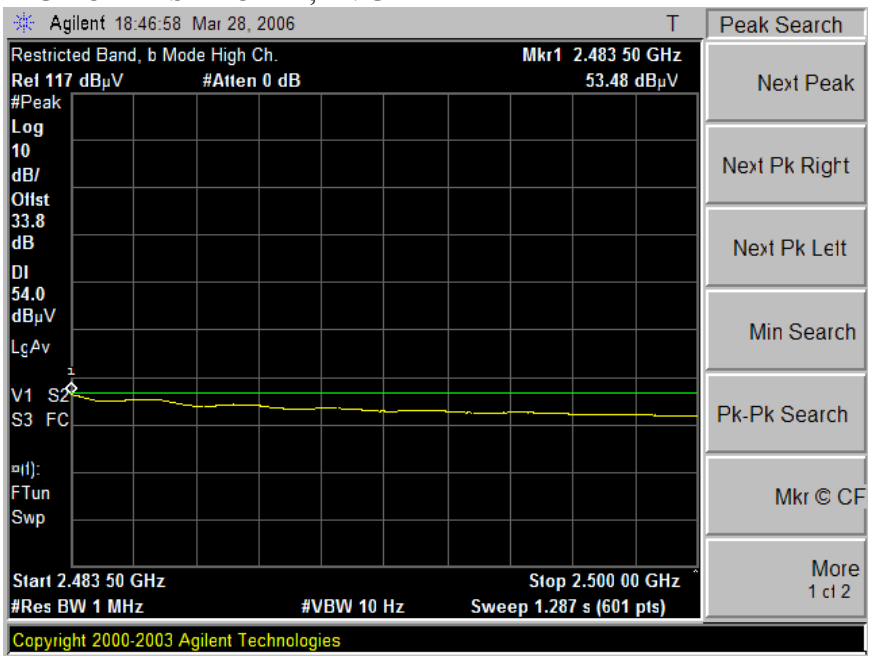


RESTRICTED BANDEDGE (HIGH CHANNEL, 2457 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK

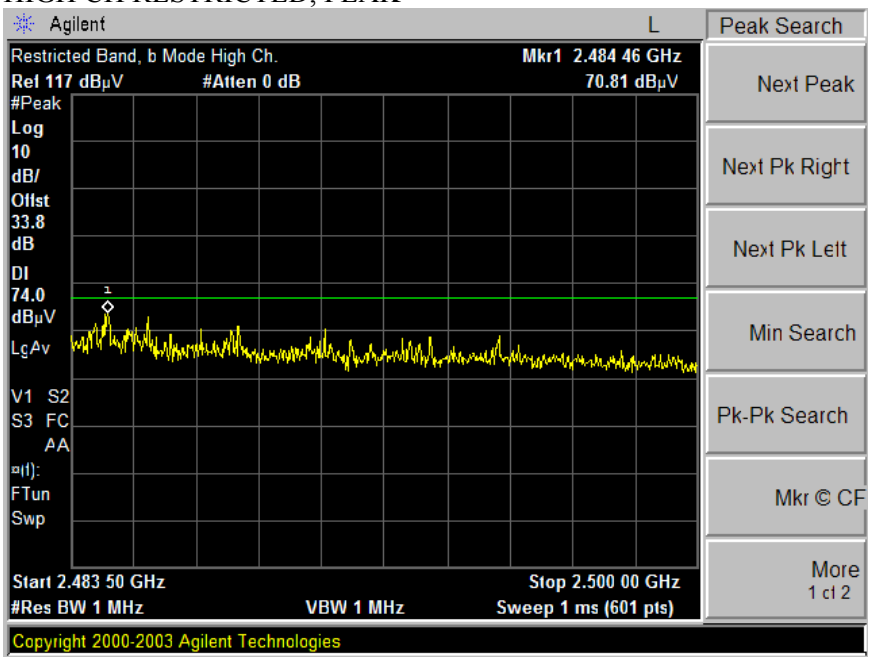


HIGH CH RESTRICTED, AVG

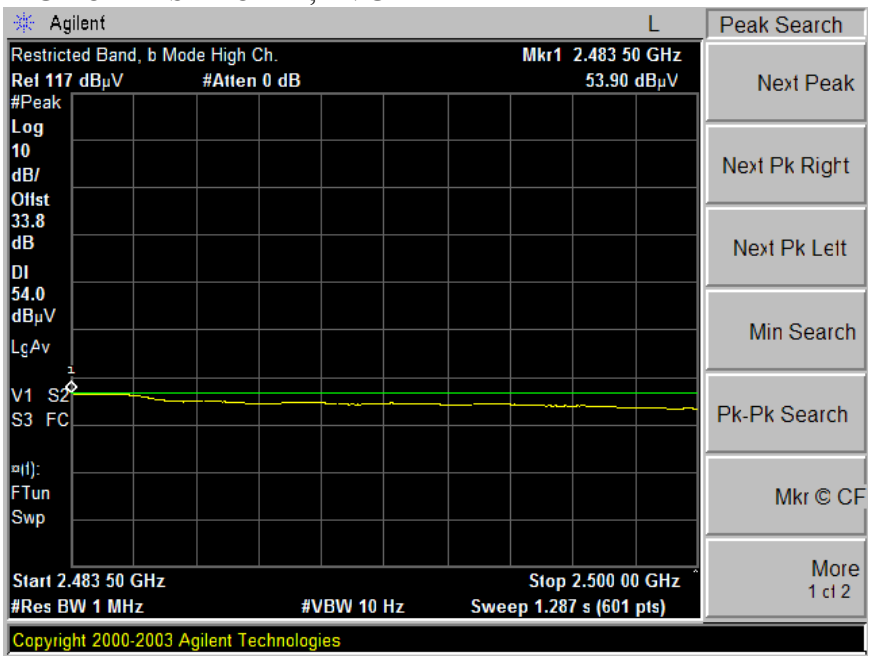


RESTRICTED BANDEDGE (HIGH CHANNEL, 2462 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK

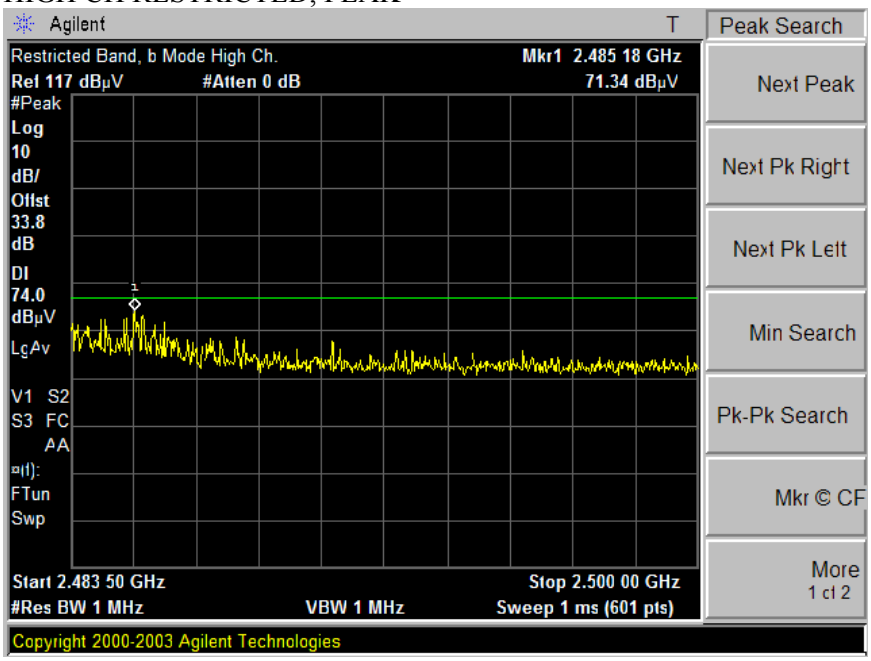


HIGH CH RESTRICTED, AVG

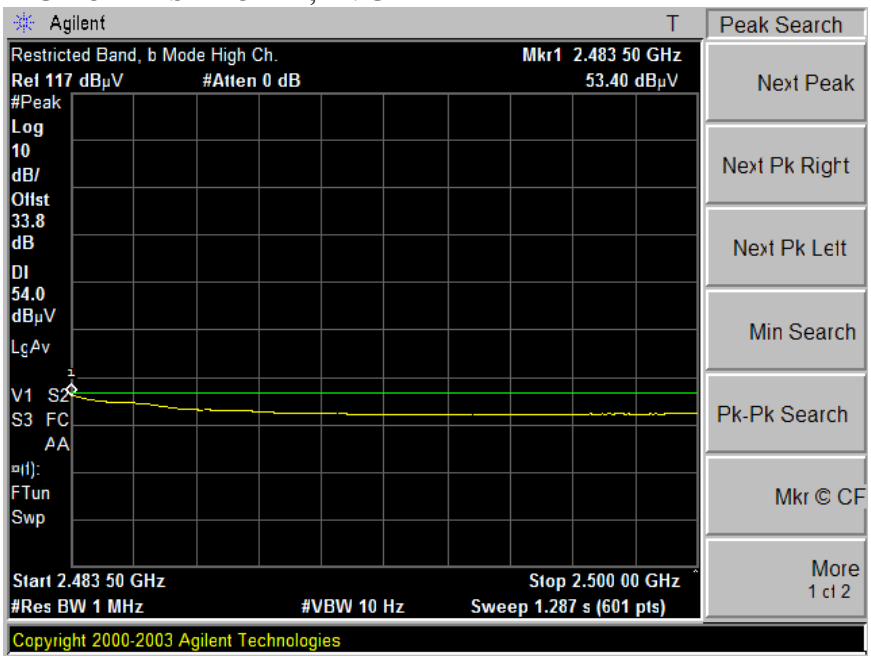


RESTRICTED BANDEDGE (HIGH CHANNEL, 2462 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK



HIGH CH RESTRICTED, AVG



HARMONICS AND SPURIOUS EMISSIONS – 20 MHz TX BANDWIDTH

03/28/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer:	Vien Tran
Project #:	06U10233
Company:	Broadcom
EUT Description:	2x2 Dual Band MIMO Device
EUT M/N:	BCM94321MCAG Rev 3.0
EUT S/N:	107
Test Target:	FCC 15.247
Mode Of Operation:	2.4 GHz Band_Tx 20 MHz BANDWIDTH

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T87 Miteq 924342			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Vien 187215002	Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 2412 MHz_17dBm															
4.824	3.0	62.3	53.3	33.9	2.9	-45.3	0.0	0.6	54.4	45.4	74	54	-19.6	-8.6	V
7.236	3.0	54.4	45.4	35.9	4.2	-43.3	0.0	0.6	51.7	42.7	74	54	-22.3	-11.3	H
9.648	3.0	52.1	40.9	37.6	4.7	-39.9	0.0	0.8	55.4	44.2	74	54	-18.6	-9.8	H
12.060	3.0	46.9	35.7	38.6	4.8	-40.0	0.0	0.9	51.3	40.1	74	54	-22.7	-13.9	H
4.824	3.0	69.0	61.3	33.9	2.9	-45.3	0.0	0.6	61.1	53.4	74	54	-12.9	-0.6	H
7.236	3.0	60.0	48.8	35.9	4.2	-43.3	0.0	0.6	57.3	46.1	74	54	-16.7	-7.9	H
9.648	3.0	54.8	43.6	37.6	4.7	-39.9	0.0	0.8	58.1	46.9	74	54	-15.9	-7.1	H
12.060	3.0	49.6	37.9	38.6	4.8	-40.0	0.0	0.9	53.9	42.2	74	54	-20.1	-11.8	H
															H
Mid Ch, 2437 MHz_17dBm															
4.874	3.0	59.6	51.1	34.0	3.0	-45.3	0.0	0.6	51.8	43.3	74	54	-22.2	-10.7	H
7.311	3.0	47.4	36.6	35.9	4.2	-43.2	0.0	0.6	44.8	34.0	74	54	-29.2	-20.0	H
9.748	3.0	44.2	33.4	37.7	4.7	-39.6	0.0	0.8	47.8	37.0	74	54	-26.2	-17.0	H
12.185	3.0	41.4	30.7	38.6	4.9	-40.1	0.0	0.9	45.7	35.0	74	54	-28.3	-19.0	H
4.874	3.0	68.2	59.7	34.0	3.0	-45.3	0.0	0.6	60.4	51.9	74	54	-13.6	-2.1	H
7.311	3.0	56.0	45.2	35.9	4.2	-43.2	0.0	0.6	53.5	42.7	74	54	-20.5	-11.3	H
9.748	3.0	52.8	42.0	37.7	4.7	-39.6	0.0	0.8	56.4	45.6	74	54	-17.6	-8.4	H
12.185	3.0	50.0	39.3	38.6	4.9	-40.1	0.0	0.9	54.3	43.6	74	54	-19.7	-10.4	H
High Ch, 2462 MHz_17dBm															
4.924	3.0	62.0	52.5	34.0	3.1	-45.4	0.0	0.6	54.3	44.8	74	54	-19.7	-9.2	V
7.386	3.0	53.0	43.5	35.9	4.2	-43.1	0.0	0.6	50.7	41.2	74	54	-23.3	-12.8	V
9.484	3.0	48.7	36.8	37.4	4.7	-40.2	0.0	0.8	51.4	39.5	74	54	-22.6	-14.5	V
12.310	3.0	45.7	36.1	38.7	4.9	-40.2	0.0	0.9	50.1	40.5	74	54	-23.9	-13.5	V
4.924	3.0	68.8	60.7	34.0	3.1	-45.4	0.0	0.6	61.1	53.0	74	54	-12.9	-1.0	H
7.386	3.0	57.7	45.8	35.9	4.2	-43.1	0.0	0.6	55.3	43.4	74	54	-18.7	-10.6	H
9.484	3.0	54.7	45.1	37.4	4.7	-40.2	0.0	0.8	57.4	47.8	74	54	-16.6	-6.2	H
12.310	3.0	52.0	41.0	38.7	4.9	-40.2	0.0	0.9	56.3	45.3	74	54	-17.7	-8.7	H
Note: No other emissions were detected above the noise floor															

HARMONICS AND SPURIOUS EMISSIONS – 20 MHz TX BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10708
Date: 01/04/07
Test Engineer: Chien Ho
Configuration: EUT & Antenna
Mode: Tx 2.4 GHz_11n 20MHz MIMO CDD MCS 0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T87 Miteq 924342			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Gordon 177080004	Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Ch 6 11n 20MHz MIMO CDD MCS 0 19dBm															
4.874	3.0	58.7	47.0	33.7	3.6	-45.3	0.0	0.6	51.4	39.7	74	54	-22.6	-14.3	V
7.311	3.0	63.9	47.7	35.2	4.4	-43.2	0.0	0.6	60.9	44.7	74	54	-13.1	-9.3	V
12.183	3.0	51.1	38.7	37.7	5.5	-40.1	0.0	0.9	55.1	42.7	74	54	-18.9	-11.3	V
4.874	3.0	61.8	57.2	33.7	3.6	-45.3	0.0	0.6	54.5	49.9	74	54	-19.5	-4.1	H
7.311	3.0	61.8	48.9	35.2	4.4	-43.2	0.0	0.6	58.8	45.9	74	54	-15.2	-8.1	H
12.183	3.0	52.4	41.4	37.7	5.5	-40.1	0.0	0.9	56.4	45.4	74	54	-17.6	-8.6	H
			No other emissions were detected above system noise floor												

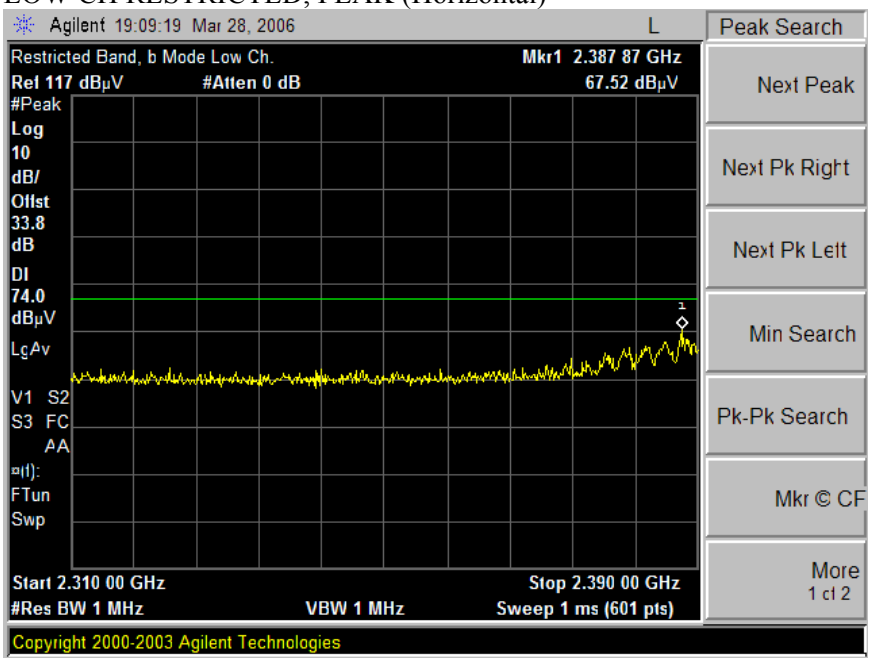
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

802.11n Mode 20 MHz SISO is covered by the worst case 802.11g mode Legacy testing.

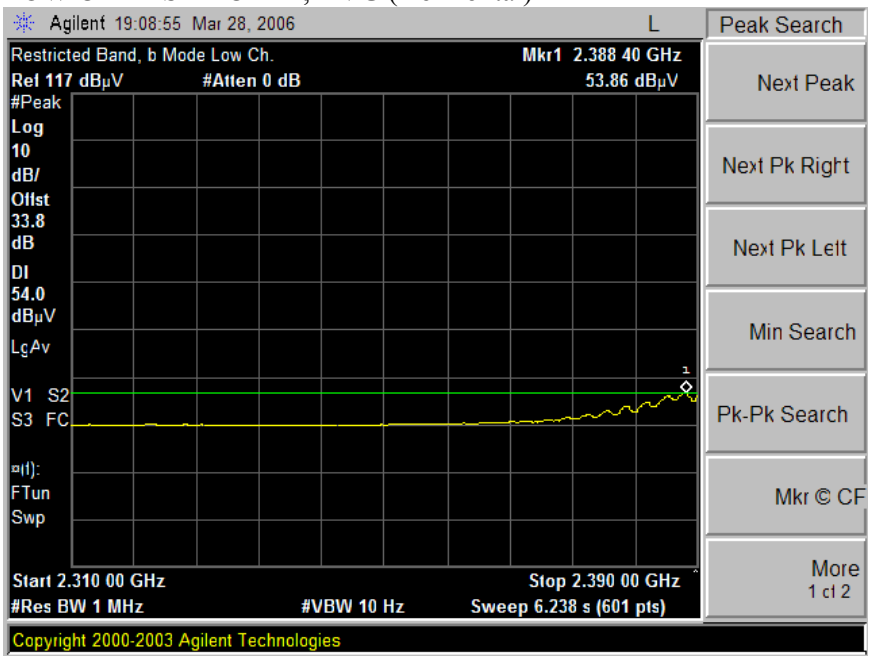
802.11n Mode 40 MHz MIMO

RESTRICTED BANDEDGE (LOW CHANNEL, 2422 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Horizontal)

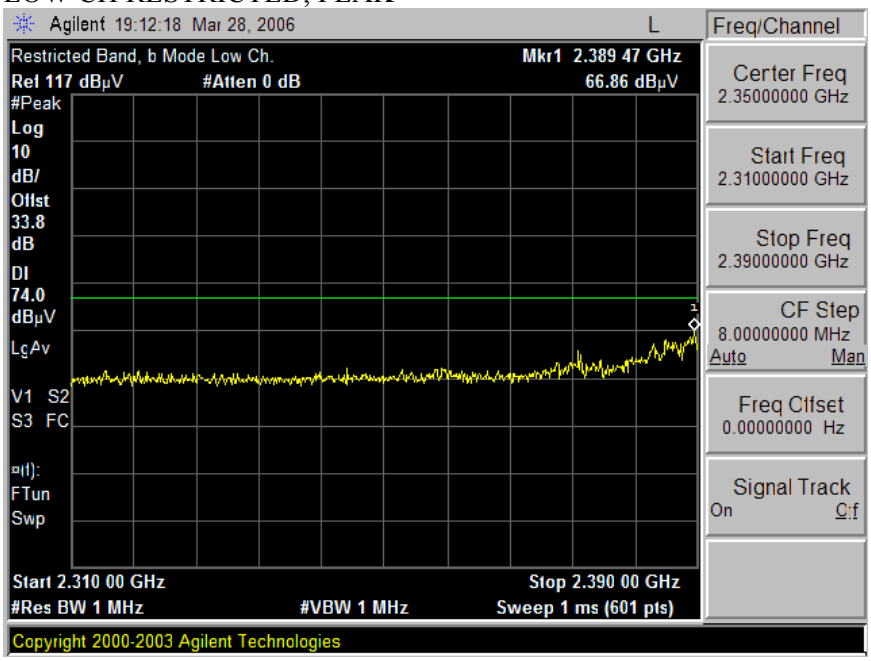


LOW CH RESTRICTED, AVG (Horizontal)

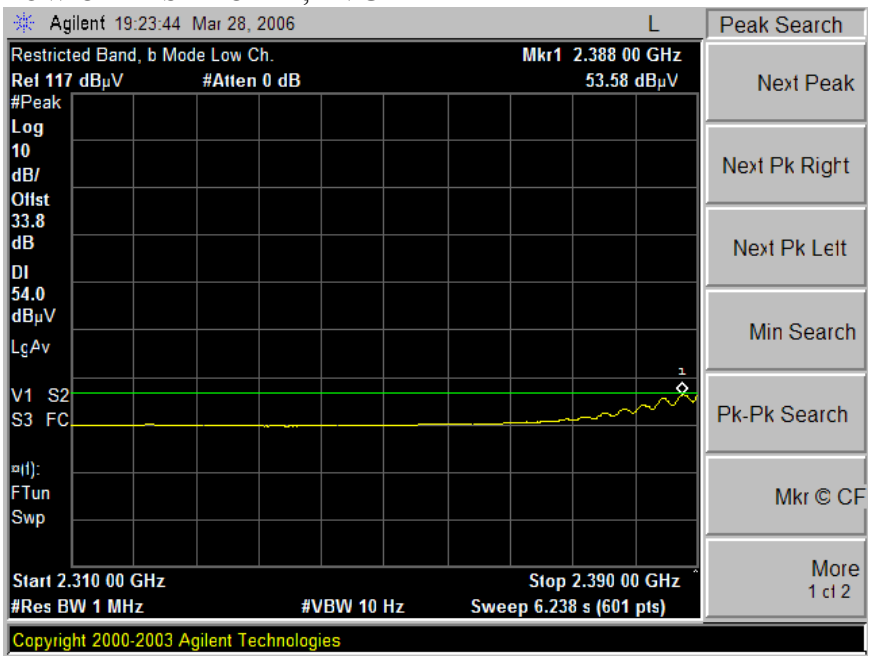


RESTRICTED BANDEDGE (LOW CHANNEL, 2422 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK

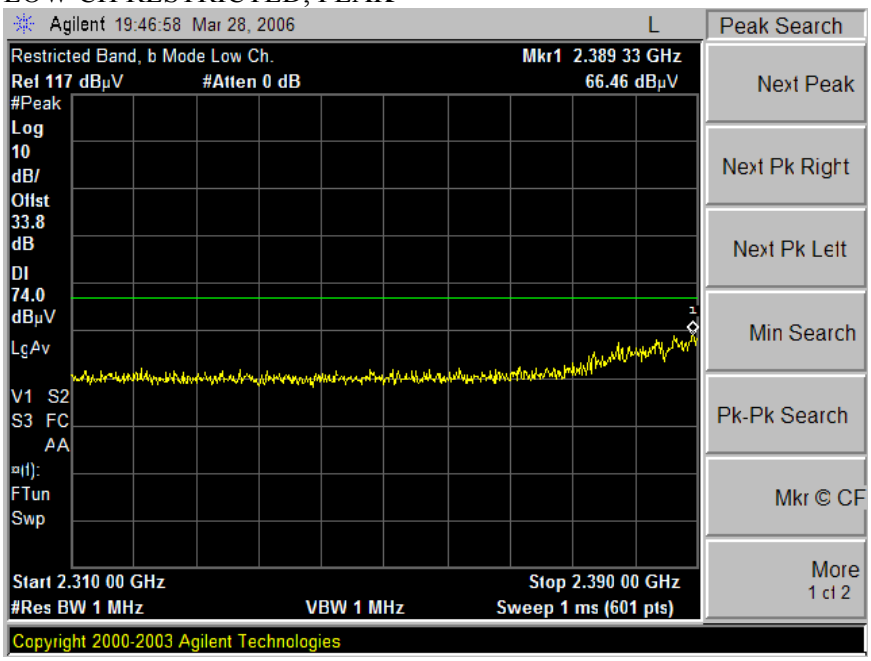


LOW CH RESTRICTED, AVG

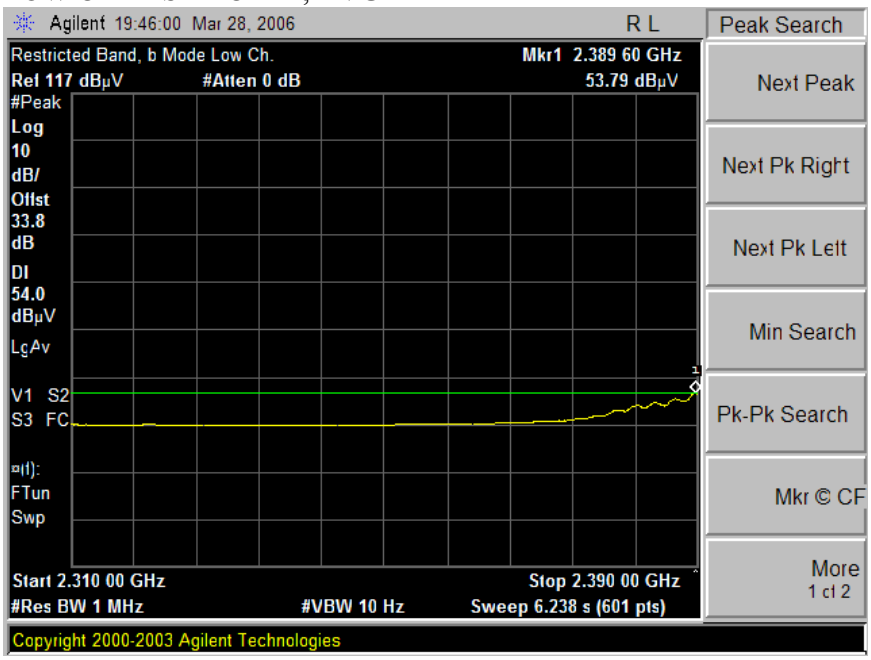


RESTRICTED BANDEDGE (LOW CHANNEL, 2427 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK

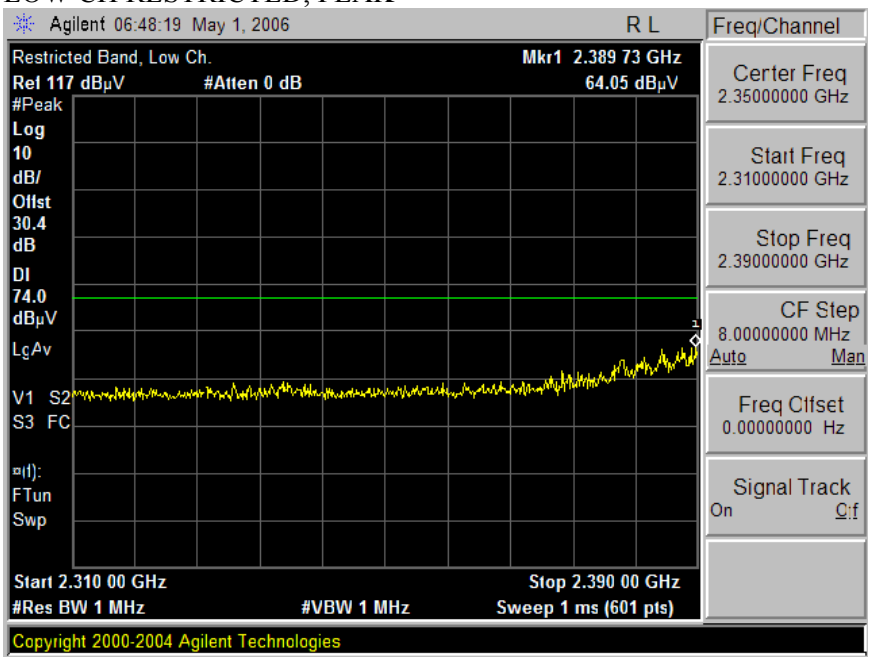


LOW CH RESTRICTED, AVG

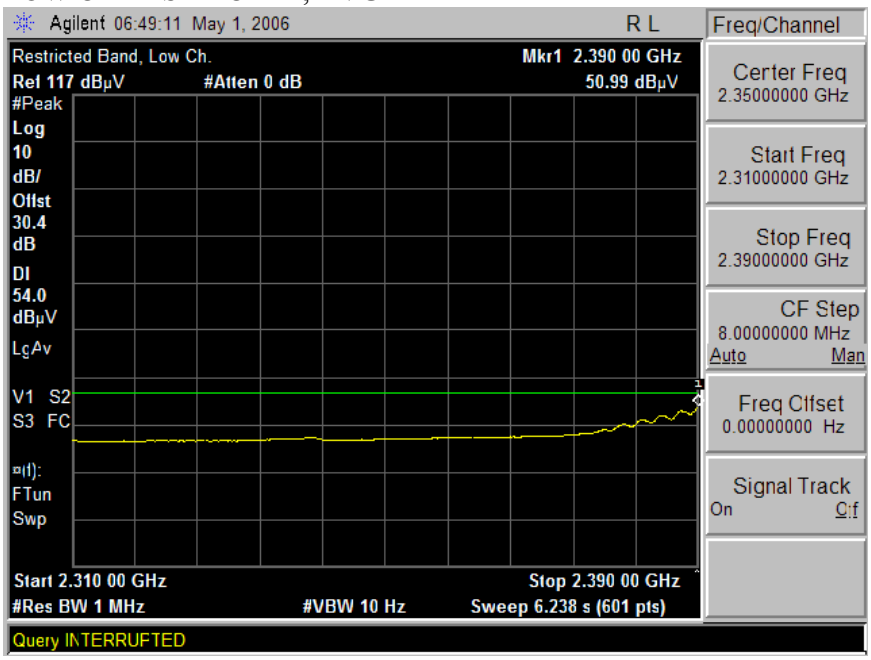


RESTRICTED BANDEDGE (LOW CHANNEL, 2427 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK

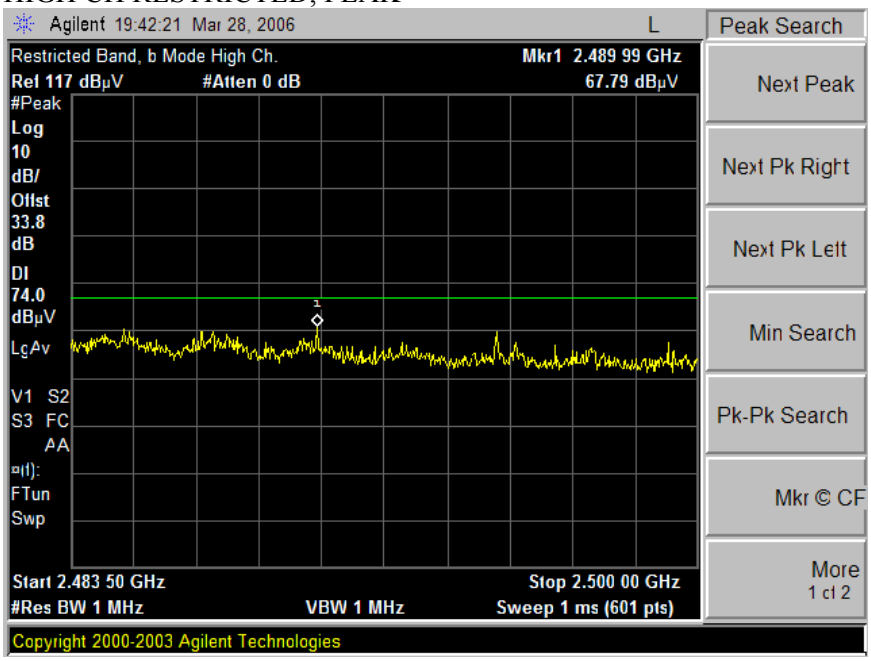


LOW CH RESTRICTED, AVG

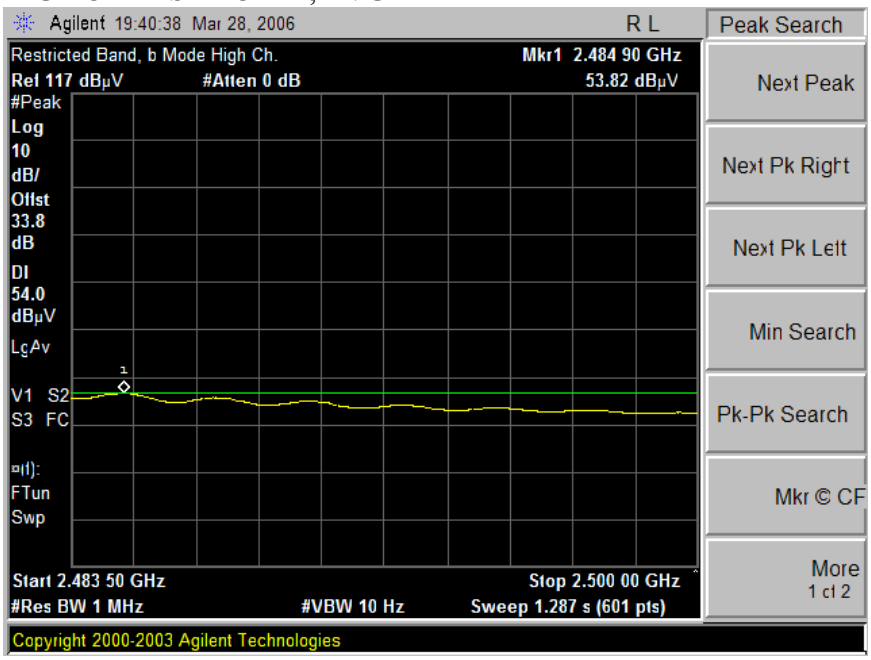


RESTRICTED BANDEDGE (HIGHCHANNEL, 2442 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK

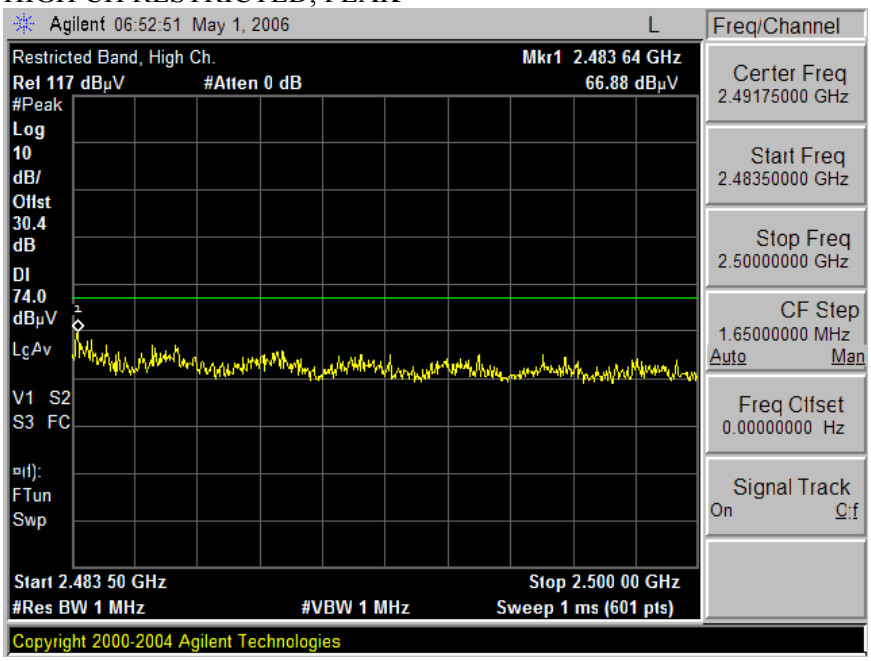


HIGH CH RESTRICTED, AVG

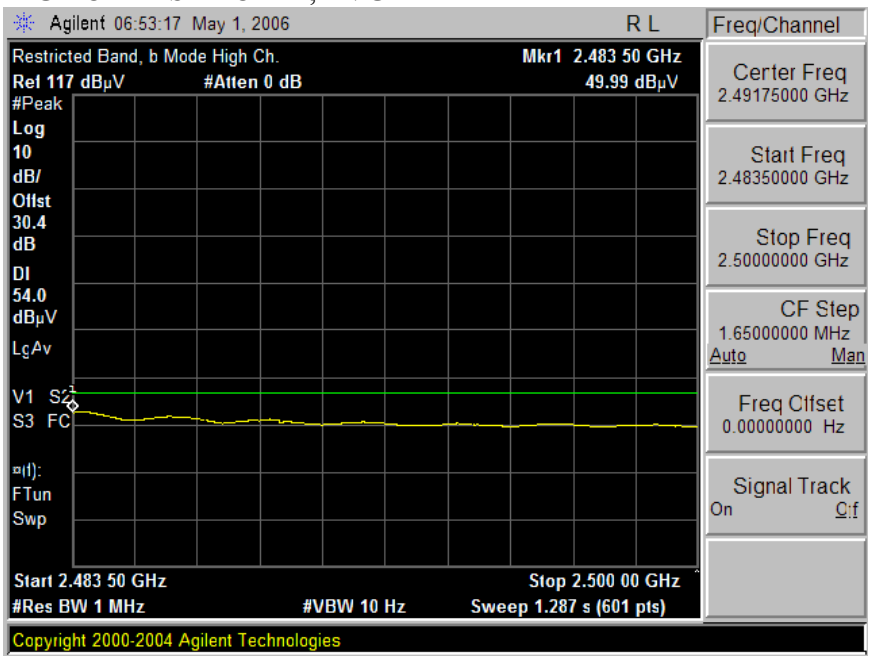


RESTRICTED BANDEDGE (HIGH CHANNEL, 2442 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK

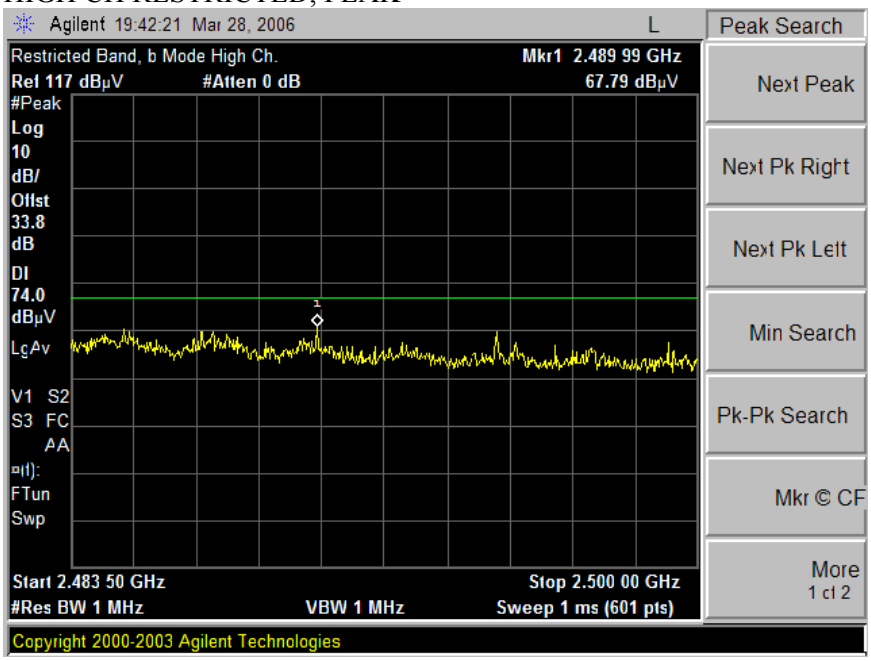


HIGH CH RESTRICTED, AVG

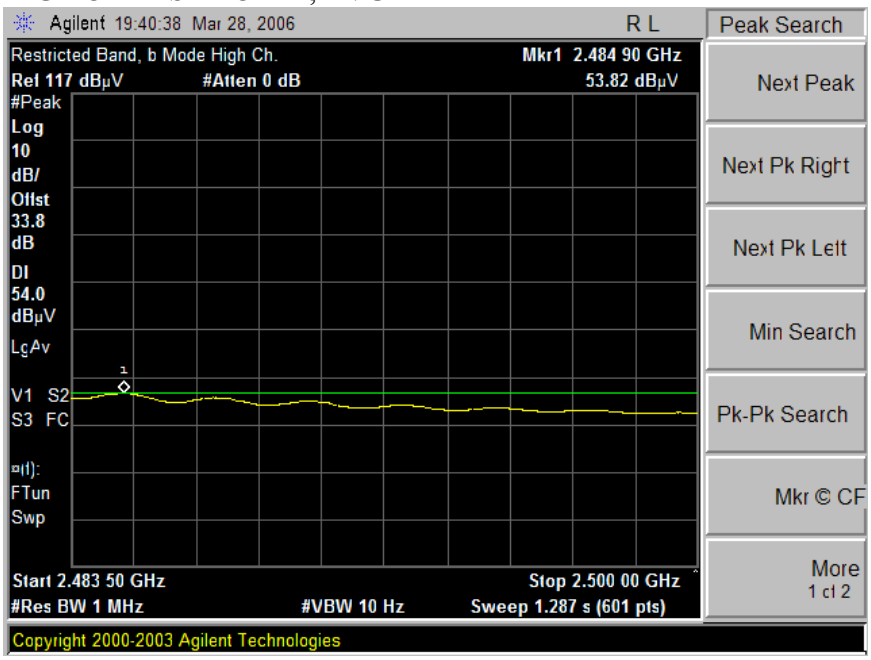


RESTRICTED BANDEDGE (HIGHCHANNEL, 2447 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK

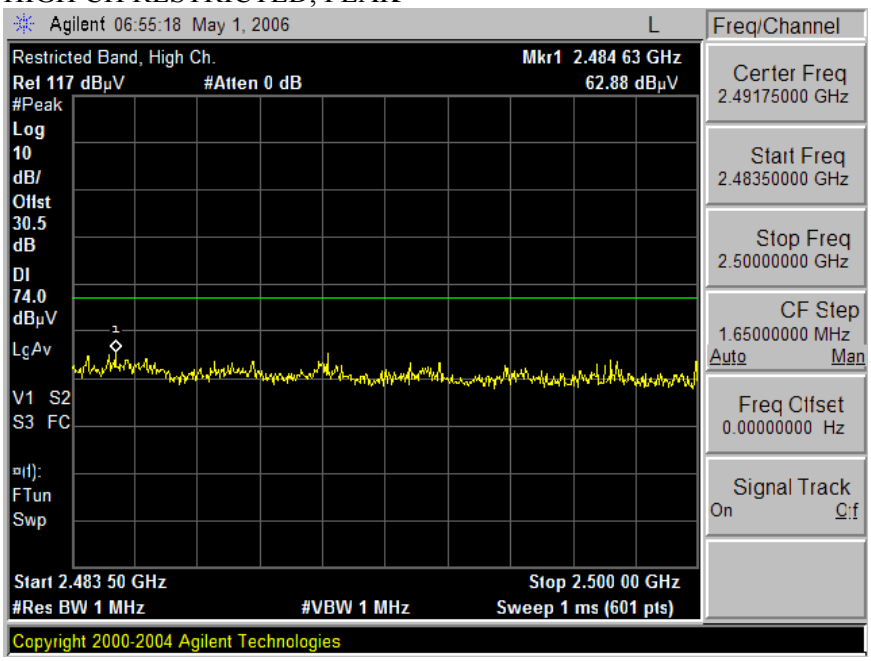


HIGH CH RESTRICTED, AVG

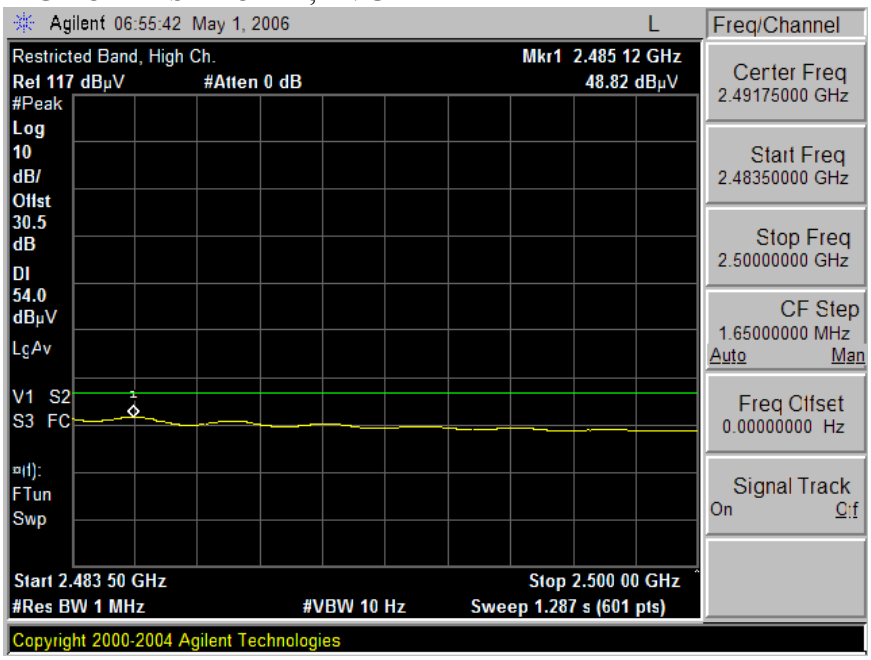


RESTRICTED BANDEDGE (HIGH CHANNEL, 2447 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK

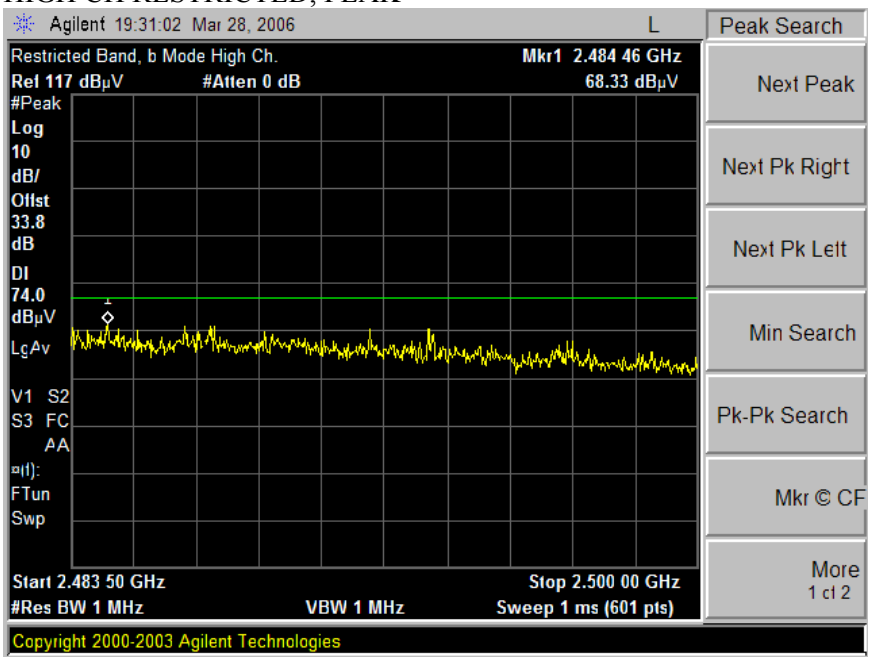


HIGH CH RESTRICTED, AVG

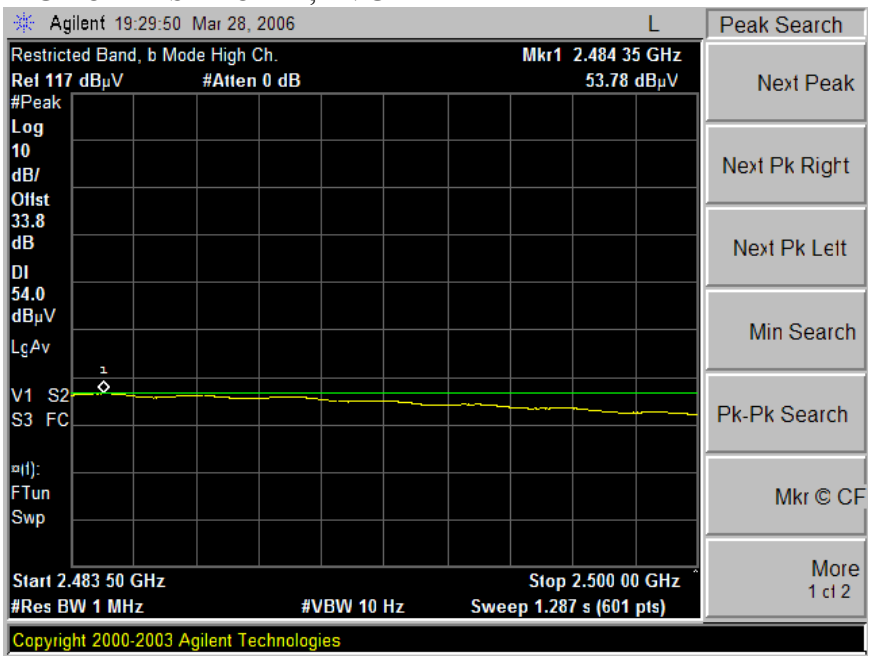


RESTRICTED BANDEDGE (HIGH CHANNEL, 2452 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK

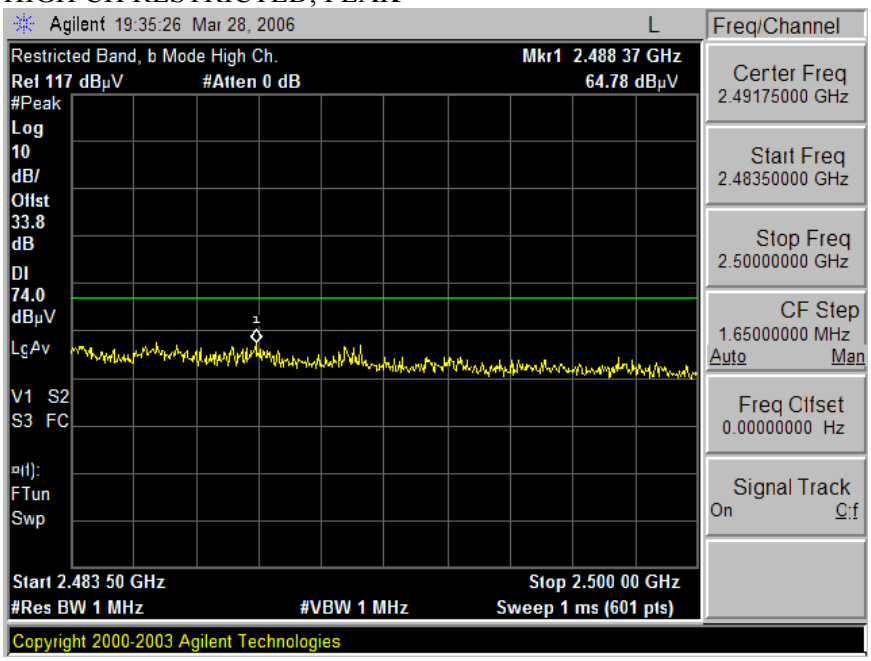


HIGH CH RESTRICTED, AVG

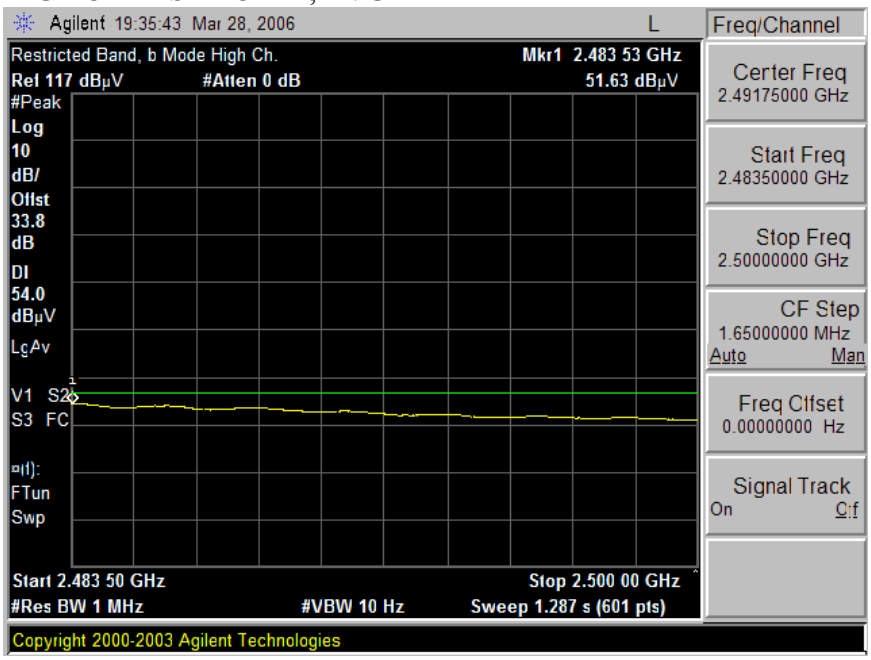


RESTRICTED BANDEDGE (HIGH CHANNEL, 2452 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK



HIGH CH RESTRICTED, AVG



11n Mode 40 MHz MIMO

HARMONICS AND SPURIOUS EMISSIONS – 40 MHz TX BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10708
Date: 01/05/07
Test Engineer: Vien Tran
Configuration: EUT
Mode: Tx 2.4 GHz_11n 40MHz MIMO

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T87 Miteq 924342			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Ch 3, 2437 MHz 15.5dBm															
4.874	3.0	55.3	46.1	33.7	3.4	-45.3	0.0	0.6	47.7	38.5	74	54	-26.3	-15.5	V
7.311	3.0	53.3	42.2	35.2	3.9	-43.2	0.0	0.6	49.8	38.7	74	54	-24.2	-15.3	V
4.874	3.0	59.6	57.9	33.7	3.4	-45.3	0.0	0.6	52.0	50.3	74	54	-22.0	-3.7	H
7.311	3.0	57.8	43.3	35.2	3.9	-43.2	0.0	0.6	54.3	39.8	74	54	-19.7	-14.2	H
Ch 6, 2437 MHz 15.5dBm															
4.874	3.0	55.6	47.4	33.7	3.4	-45.3	0.0	0.6	48.0	39.8	74	54	-26.0	-14.2	V
7.311	3.0	53.0	42.8	35.2	3.9	-43.2	0.0	0.6	49.5	39.3	74	54	-24.5	-14.7	V
4.874	3.0	61.5	58.7	33.7	3.4	-45.3	0.0	0.6	53.9	51.1	74	54	-20.1	-2.9	H
7.311	3.0	58.2	44.5	35.2	3.9	-43.2	0.0	0.6	54.7	41.0	74	54	-19.3	-13.0	H
Ch 9, 2452 MHz 15.5dBm															
4.904	3.0	56.0	48.0	33.8	3.4	-45.3	0.0	0.6	48.5	40.5	74	54	-25.5	-13.5	V
7.356	3.0	54.3	43.3	35.2	3.9	-43.1	0.0	0.6	50.9	39.9	74	54	-23.1	-14.1	V
4.904	3.0	61.9	59.1	33.8	3.4	-45.3	0.0	0.6	54.4	51.6	74	54	-19.6	-2.4	H
7.356	3.0	59.1	44.7	35.2	3.9	-43.1	0.0	0.6	55.7	41.3	74	54	-18.3	-12.7	H
			No other emissions were detected above system noise floor												

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.5.5. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND

11n 20 MHz CDD MCS 0

HARMONICS AND SPURIOUS EMISSIONS – 20 MHz TX BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: BroadCom
Project #: 06U10708
Date: 01/09/2007
Test Engineer: Thanh Nguyen
Configuration: EUT, Antenna, Laptop.
Mode: Transmit 5.8GHz_11n20MHz CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch															
11.490	3.0	51.3	39.6	37.6	5.0	-33.1	0.0	0.7	61.5	49.8	74	54	-12.5	-4.2	V
17.235	3.0	44.4	30.6	40.2	6.0	-32.0	0.0	0.6	59.3	45.4	74	54	-14.7	-8.6	V
11.490	3.0	53.5	42.8	37.6	5.0	-33.1	0.0	0.7	63.7	53.0	74	54	-10.3	-1.0	H
17.235	3.0	43.1	30.8	40.2	6.0	-32.0	0.0	0.6	57.9	45.6	74	54	-16.1	-8.4	H
Mid Ch.															
11.570	3.0	53.6	41.3	37.6	5.0	-33.0	0.0	0.7	63.9	51.7	74	54	-10.1	-2.3	V
17.355	3.0	43.7	31.8	40.3	6.0	-32.0	0.0	0.6	58.6	46.7	74	54	-15.4	-7.3	V
11.570	3.0	57.3	43.5	37.6	5.0	-33.0	0.0	0.7	67.7	53.9	74	54	-6.3	-0.1	H
17.355	3.0	44.5	32.9	40.3	6.0	-32.0	0.0	0.6	59.4	47.8	74	54	-14.6	-6.2	V
															V
High Ch															
11.650	3.0	55.4	43.3	37.7	5.1	-32.9	0.0	0.7	65.9	53.8	74	54	-8.1	-0.2	H
17.475	3.0	43.7	31.3	40.5	6.0	-32.0	0.0	0.6	58.7	46.3	74	54	-15.3	-7.7	H
11.650	3.0	51.6	39.5	37.7	5.1	-32.9	0.0	0.7	62.1	50.0	74	54	-11.9	-4.0	V
17.475	3.0	42.8	30.3	40.5	6.0	-32.0	0.0	0.6	57.9	45.4	74	54	-16.1	-8.6	V
No other spurious were detected above 2nd harmonoic.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

11n 40 MHz CDD MCS 32

HARMONICS AND SPURIOUS EMISSIONS – 40 MHz TX BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: BroadCom
Project #: 06U10708
Date: 01/08/2007
Test Engineer: Thanh Nguyen
Configuration: EUT, Antenna, Laptop.
Mode: Transmit 5.8GHz_11n40MHz CDD MCS32

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A005(			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Ch. 151															
11.510	3.0	54.2	39.5	37.6	5.0	-33.1	0.0	0.7	64.5	49.8	74	54	-9.5	-4.2	V
17.265	3.0	44.1	30.5	40.3	6.0	-32.0	0.0	0.6	59.0	45.4	74	54	-15.0	-8.6	V
11.510	3.0	55.1	41.8	37.6	5.0	-33.1	0.0	0.7	65.4	52.0	74	54	-8.6	-2.0	H
17.265	3.0	44.7	31.3	40.3	6.0	-32.0	0.0	0.6	59.5	46.1	74	54	-14.5	-7.9	H
Ch. 159															
11.590	3.0	52.4	39.0	37.6	5.1	-33.0	0.0	0.7	62.8	49.4	74	54	-11.2	-4.6	V
17.385	3.0	42.7	30.5	40.4	6.0	-32.0	0.0	0.6	57.7	45.5	74	54	-16.3	-8.5	V
11.590	3.0	57.8	43.3	37.6	5.1	-33.0	0.0	0.7	68.2	53.7	74	54	-5.8	-0.3	H
17.385	3.0	43.4	31.2	40.4	6.0	-32.0	0.0	0.6	58.4	46.2	74	54	-15.6	-7.8	H
No other spurious emissions were detected above 2nd Harmonic.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

2.4 GHz BAND

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: 06U10708.EMI Date: 01-03-2007 Time: 13:41:11
Audix ATC

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : William Zhuang
Company: : Broadcom
Project #: : 06U10708
Configuration: : EUT/ Laptop
Mode of Operation:: TX 2.4GHz band, Worst Case
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	31.940	9.59	19.94	29.53	40.00	-10.47	Peak
2	104.690	19.02	12.38	31.40	43.50	-12.10	Peak
3	148.340	20.57	14.33	34.89	43.50	-8.61	Peak
4	172.590	21.41	13.31	34.72	43.50	-8.78	Peak
5	205.570	25.96	13.71	39.67	43.50	-3.83	Peak
6	218.180	26.46	12.51	38.97	46.00	-7.03	Peak
7	247.280	24.32	13.75	38.06	46.00	-7.94	Peak
8	407.330	25.15	18.21	43.36	46.00	-2.64	Peak
9	761.380	21.52	24.02	45.54	46.00	-0.46	Peak
10	904.940	17.26	25.99	43.25	46.00	-2.75	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 8 File#: 06U10708.EMI Date: 01-03-2007 Time: 13:48:44
Audix ATC

Condition: FCC CLASS-B VERTICAL
Test Operator: : William Zhuang
Company: : Broadcom
Project #: : 06U10708
Configuration: : EUT/ Laptop
Mode of Operation:: TX 2.4GHz band, Worst Case
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	128.940	18.97	15.15	34.12	43.50	-9.38	Peak
2	206.540	21.13	13.61	34.74	43.50	-8.76	Peak
3	407.330	20.12	18.21	38.33	46.00	-7.67	Peak
4	521.790	17.69	20.55	38.24	46.00	-7.76	Peak
5	707.060	14.92	23.20	38.12	46.00	-7.88	Peak
6	904.940	14.59	25.99	40.58	46.00	-5.42	Peak

5 GHz BAND

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 14 File#: 06U10708.EMI Date: 01-03-2007 Time: 14:29:54
Audix ATC

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : William Zhuang
Company: : Broadcom
Project #: : 06U10708
Configuration: : EUT/ Laptop
Mode of Operation:: TX 5.8GHz band, Worst Case
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	172.590	24.10	13.31	37.41	43.50	-6.09	Peak
2	204.600	24.79	13.91	38.70	43.50	-4.80	Peak
3	344.280	22.94	16.79	39.73	46.00	-6.27	Peak
4	408.300	24.99	18.25	43.24	46.00	-2.76	Peak
5	488.810	21.03	20.03	41.05	46.00	-4.95	Peak
6	523.730	19.35	20.62	39.97	46.00	-6.03	Peak
7	906.880	19.14	26.01	45.15	46.00	-0.85	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 16 File#: 06U10708.EMI Date: 01-03-2007 Time: 14:39:41
Audix ATC

Condition: FCC CLASS-B VERTICAL
Test Operator: : William Zhuang
Company: : Broadcom
Project #: : 06U10708
Configuration: : EUT/ Laptop
Mode of Operation:: TX 5.8GHz band, Worst Case
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	104.690	26.47	12.38	38.85	43.50	-4.65	Peak
2	128.940	18.29	15.15	33.44	43.50	-10.06	Peak
3	206.540	19.60	13.61	33.21	43.50	-10.29	Peak
4	290.930	16.98	15.33	32.31	46.00	-13.69	Peak
5	315.180	16.60	16.08	32.68	46.00	-13.32	Peak
6	406.360	18.66	18.20	36.85	46.00	-9.15	Peak
7	523.730	17.46	20.62	38.08	46.00	-7.92	Peak
8	903.000	14.11	25.95	40.06	46.00	-5.94	Peak

7.6. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

2.4 GH z BAND

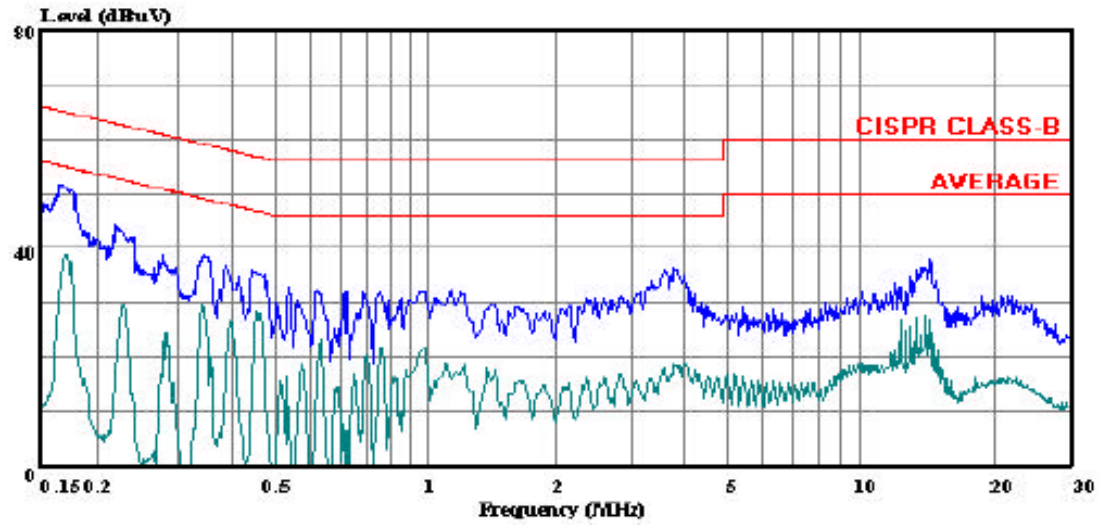
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.17	51.37	--	38.56	0.00	65.16	55.16	-13.79	-16.60	L1
0.24	43.92	--	29.86	0.00	62.17	52.17	-18.25	-22.31	L1
3.95	36.12	--	24.00	0.00	56.00	46.00	-19.88	-22.00	L1
0.18	52.27	--	40.72	0.00	64.49	54.49	-12.22	-13.77	L2
0.24	43.92	--	35.37	0.00	62.17	52.17	-18.25	-16.80	L2
4.10	36.12	--	26.99	0.00	56.00	46.00	-19.88	-19.01	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 21 File#: 06u10708.EMI Date: 12-07-2006 Time: 15:07:26



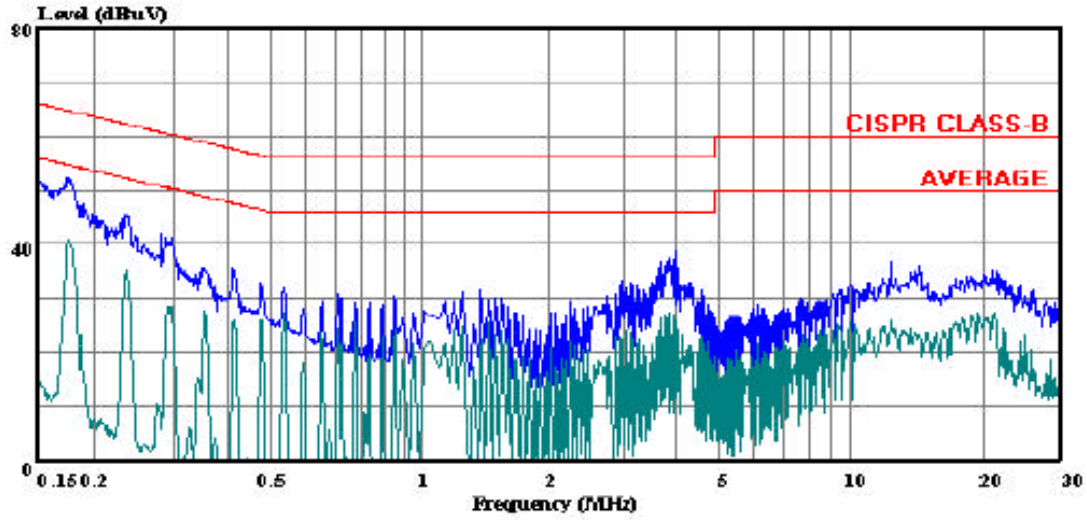
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10708
Company : Broadcom
EUT configuration: EUT & Laptop
Mode of operation: Tx worst case 2.4 GHz
Power Source : 115VAC / 60Hz
: Line 1: Peak (Blue), Avg (Green)
: FCC Class B

LINE 2 RESULTS

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 14 File#: 06u10708.EMI Date: 12-07-2006 Time: 14:47:40



Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10708
Company : Broadcom
EUT configuration: EUT & Laptop
Mode of operation: Tx worst case 2.4 GHz
Power Source : 115VAC / 60Hz
: Line 2: Peak (Blue), Avg (Green)
: FCC Class B

5 GHz BAND

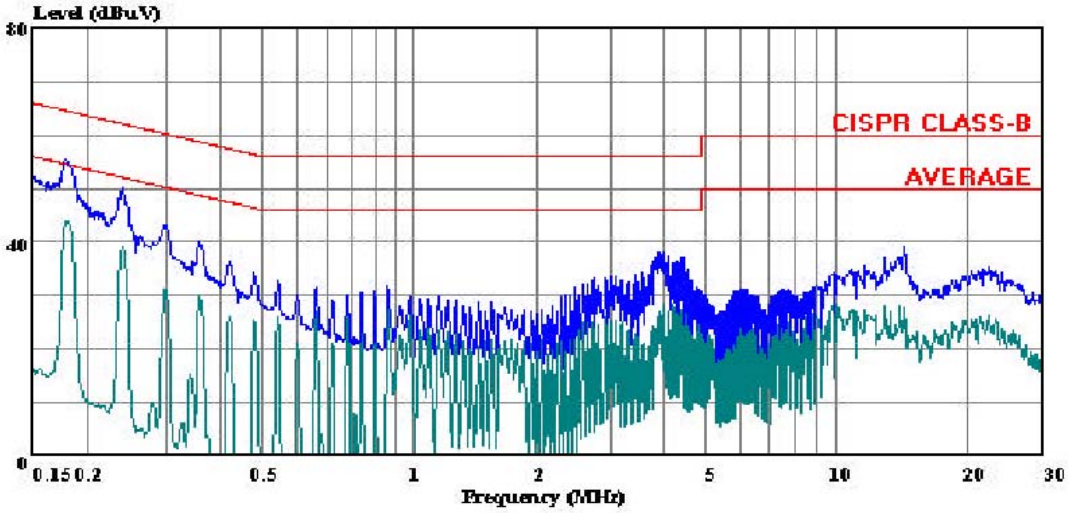
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.18	55.32	--	44.00	0.00	64.49	54.49	-9.17	-10.49	L1
0.24	50.36	--	38.98	0.00	62.10	52.10	-11.74	-13.12	L1
4.05	37.97	--	28.50	0.00	56.00	46.00	-18.03	-17.50	L1
0.18	51.51	--	39.12	0.00	64.49	54.49	-12.98	-15.37	L2
0.24	42.85	--	20.62	0.00	62.10	52.10	-19.25	-31.48	L2
4.05	35.63	--	18.90	0.00	56.00	46.00	-20.37	-27.10	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 7 File#: 06u10708.EMI Date: 12-07-2006 Time: 14:27:02



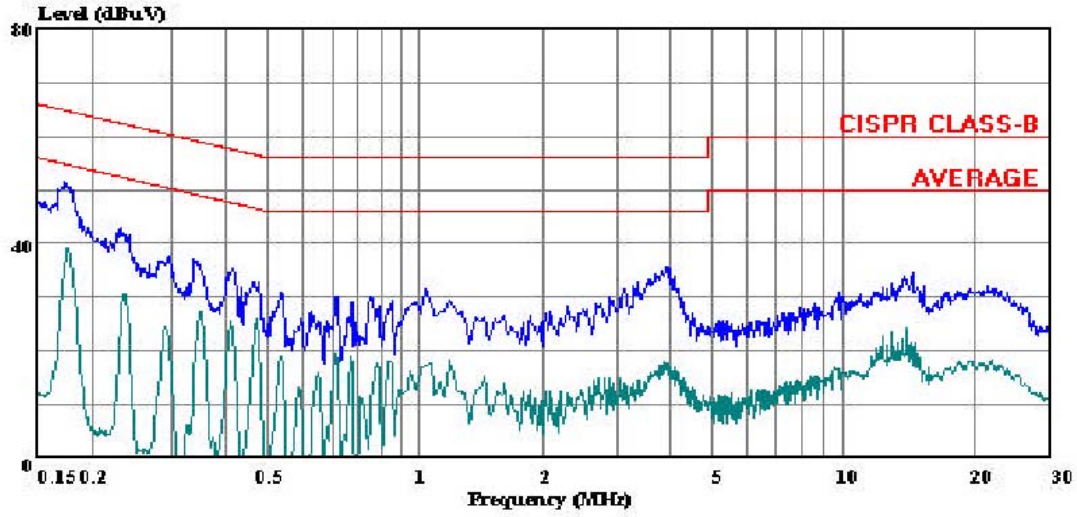
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10708
Company : Broadcom
EUT configuration: EUT & Laptop
Mode of operation: Tx worst case 5 GHz
Power Source : 115VAC / 60Hz
: Line 1: Peak (Blue), Avg (Green)
: FCC Class B

LINE 2 RESULTS

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 28 File#: 06u10708.EMI Date: 12-07-2006 Time: 15:30:52



Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10708
Company : Broadcom
EUT configuration: EUT & Laptop
Mode of operation: Tx worst case 5 GHz
Power Source : 115VAC / 60Hz
: Line 2: Peak (Blue), Avg (Green)
: FCC Class B